

APPLYING PRINCIPLES OF UNIVERSAL DESIGN FOR LEARNING TO EARLY
ELEMENTARY MATH CLASSES IN JAPAN: A CASE STUDY

by

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ABSTRACT

Beginning in April 2007, the Japanese government implemented efforts to shift the focus of educational policy away from the notion of “Special Education” towards “Special Needs Education”. The primary objective of this change in focus is to move towards a policy of ensuring that the educational needs of students with learning disabilities and other mild developmental disabilities are met in the general education system. However, no model is shown that addresses how these students are taught with typically developing students in general classrooms. There is urgent need to investigate how principles of universal design for learning (UDL) can be applied to classrooms with a traditional Japanese educational culture.

The study was conducted using a consultation approach designed to support the early elementary general education teachers in adopting and implementing a UDL approach to their math curriculum and instructional methods. A qualitative case study approach was employed to investigate (a) the impact of the consultation on teachers in terms of changes in teaching practice regarding UDL, (b) barriers to and ways to facilitate adopting and implementing the innovation of UDL, and (c) the impact of implementing UDL principles on student outcomes.

The study verified that it is possible to implement teaching practices with values of UDL principles in conjunction with positive aspects of Japanese collectivism values. It was found that in the successful cases, teachers’ practices demonstrated well-balanced focuses on both facilitating whole group dynamism and meeting a variety of individual needs, which had positive impact on students’ outcomes. Implications for practice and for future research and limitations of the research are discussed.

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CHAPTER 1

Literature Review

In this chapter, existing literature in the following areas will be reviewed: (a) current condition of education for learners with mild developmental disabilities in Japan and (b) research on Universal Design for Learning (UDL) in the U.S. and Japan.

Current Condition of Education for Mild Developmental Disabilities in Japan

Beginning in April 2007, the Japanese government implemented efforts to shift the focus of educational policy away from the notion of “Special Education” towards “Special Needs Education”. Fundamentally, the policy shifted from providing education according to “category and degree of disability” to meeting the “individual special educational needs” of the learner. The previous Japanese policies on “Special Education” required special education classrooms and special school systems in which students with moderate to severe disabilities were to be “pulled-out” from the general education classrooms and provided specialized instruction. In addition, many of students with learning disabilities and other mild developmental disabilities attended general education classrooms but did not receive appropriate educational supports to allow them to access the curriculum content and make meaningful progress within that content. One of the objectives of the current policy of Special Needs Education, enacted in 2007, is to ensure that the educational needs of students with learning disabilities and other mild developmental disabilities are being addressed and met in the general education context. Thus, for the first time, students with learning disabilities and other mild developmental disabilities in general education classrooms are part of “Special Needs Education”. To better understand the impact of the shift in policy on students with mild disabilities, the following areas will be

explored in the next two sections: 1) the historical context for the policy change, 2) specific implementation expectation of the “new” policy, and 3) educational issues that have been reported regarding students with learning disabilities and other mild developmental disabilities in general education classrooms in Japan.

Historical context. In 2001, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) presented a report titled *Final Report on Special Education in the 21st Century: Framework of Special Support Provision Based on Individual Needs*, which emphasized five themes as the values of Japanese special education in the 21st century. The first theme addresses normalization, defined as a belief to “create a society where people with and without disabilities participate in social activities as equal members of the society and live as independent individuals” (p. 2). The second theme addresses establishing continuous support systems for children with disabilities and their families. The third theme encourages more diverse ways to support children with disabilities including students with mild disabilities in regular classrooms. The fourth theme encourages more inclusive educational placements for students with disabilities. The last theme addresses empowerment and allowing flexibility of community and schools by lessening restrictions from central government and increasing local support. The report showed the direction of coming educational reform.

The next year, MEXT (2002) conducted a nationwide survey in order to shed light on the issues of students with mild disabilities in general classrooms and to collect basic data for establishing the specific requirements of the new policy. The survey estimated that 6.3% of students in general education classrooms might in fact have learning disabilities and other mild developmental disabilities and thus be in need of special supports in order to be successful in the

general education classroom (Ministry of Education, Culture, Sports, Science and Technology, 2002).

Expectation of the “new” policy. In 2003, MEXT presented another report titled *Final Report on Modality of Future Special Needs Education*, in which the conceptual shift from “Special Education” towards “Special Needs Education” is declared. In this report, the new framework of “Special Needs Education” is explained. Specifically, the report states,

“The beneficiaries of special needs education are expanded from those previously served by special education. Including students with learning disabilities and other mild developmental disabilities, all students with disabilities are encouraged towards independence and participation in the society. Their individual educational needs will be assessed and appropriate instruction and support will be provided.” (p. 6)

The report proposed two major reforms. First, “special schools” focusing on each disability category are changed to “special needs schools” focusing on individual special educational needs of their students. These special needs schools would be available to provide consultation for students with special needs attending the general education schools in their community. Second, the specific expectations of implementation of educational interventions for students with learning disabilities and other mild developmental disabilities in the general classrooms are delineated. Specifically, these are: a) development of an individualized educational plan for each student with learning disabilities and other developmental disabilities, b) the provision of a special needs education coordinator in every general education school, and c) utilization of resource rooms to support and ensure learning for students with learning disabilities and other mild disabilities in general classrooms (Ministry of Education, Culture, Sports, Science and

Technology, 2003).

In 2004, based on *Final Report on Modality of Future Special Needs Education* (2003) and the reformed comprehensive policy for people with disabilities titled *Master Plan for People with Disabilities* (2002), MEXT formulated guidelines for an education support system for students with learning disabilities and other mild developmental disabilities (Ministry of Education, Culture, Sports, Science and Technology, 2004). The guidelines consist of six parts: an introduction and sections explaining the guidelines specifically for each particular group of stakeholders, such that there is a section for educational administrators, school personnel, experts, individuals with disabilities, and parents. In addition to publishing and disseminating the guidelines, MEXT supported the implementation and evaluation of several model projects in every prefecture in order to disseminate and accumulate practical know-how regarding implementation of the new special needs education.

In 2007, *Reformed School Education Act* came into force, in which Special Needs Education was legally defined. MEXT issued a notice titled *Implementation of Special Needs Education* (2007) to the educational boards in all prefectures in order to ensure implementation of special needs education in every school. The notification states that each school should make clear and concerted efforts to a) establish a consultative conference system within the school, b) designate a special needs education coordinator at each school, c) develop individual education plans (IEP) for students with special needs, d) use an itinerant consultation system, and e) implement in-service training for teachers. In this system, general education classroom teachers are basically in charge of teaching students with learning disabilities and mild developmental disabilities in his/her classroom. If the teacher suspects any student may be in need of special

learning supports, the teacher is to ask for this assistance from the special needs education coordinator. The special needs coordinator will begin the process by holding a consultative conference onsite at the teacher's school. The classroom teacher may also use the itinerant consultation system to request a consultation with experts from outside the school system.

Current educational challenges in general education classrooms. To better understand the impact of the new Japanese policy of "Special Needs Education" on general education schools and students with learning disabilities and other mild developmental disabilities a review of the available professional writing and research is provided in the following section.

In 2008, MEXT (2008) released a report of their investigation of the implementation status of the "Special Needs Education" policy. For elementary schools, MEXT reported that close to 100% of the elementary schools had successfully established a consultative conference system within their schools and assigned a special needs education coordinator. In addition, 82% of the elementary schools had developed and were routinely using an individual education plan for identified students, 77% of schools were using an itinerant consultation model to provide support to the students and their general education teachers, and 64% of schools had provided in-service training regarding supporting students with learning disabilities and other mild developmental disabilities for their teachers.

The National Institute of Special Needs Education (NISE, 2007) also investigated the impact of implementation of the new policy on elementary schools and junior-high schools. For elementary level, their study found that 87% of schools reported that teachers were developing a common understanding of their roles in supporting the target students, and 75% of schools

responded that teachers came to realize the need for “special needs education” to ensure that students with learning disabilities and other mild disabilities were more likely to be successful. These data reflect a high level of compliance with the establishment of the required consultative conference system within schools and the allocation of a special needs education coordinator. On the other hand, only 30% of schools reported that teachers were actually attempting to improve their lessons following the guidelines in the “special needs education” policy. A full 60% of the schools reported that teachers didn’t know appropriate teaching methods for serving students with learning disabilities and other mild developmental disabilities in general classrooms. These findings show that although the general notion of special needs education has been successfully introduced into the general education schools, teachers are still struggling in terms of appropriately teaching students with special needs in their classrooms alongside their typically developing peers, and need practical information and specific strategies in order to improve their lessons.

These difficulties felt by teachers might affect educational placement of students with learning disabilities and other mild developmental disabilities. According to statistics data provided by MEXT (2009), since 1998, the number of students who study in special classrooms in elementary schools has increased 1.8 fold in a decade, while the number of students in general education classrooms continues to decrease. These figures may suggest that as students are identified by the general education teachers through the “special needs education” system as having difficulties in learning and behavioral issues, they are more likely to receive a diagnosis of learning disability, ADHD, mild intellectual disabilities, or autism spectrum disorders which in turn leads to facilitating their access to special classrooms and specialized educational

instructions.

Currently, the Japanese government is in the preparatory process for moving to ratification of Disability Convention of the United Nations, in which students with disabilities are declared to have the right to be educated in inclusive educational settings with reasonable accommodations and/or modifications. It is, therefore, urgent for the Japanese educational system to address just how students with special needs, especially with learning disabilities and mild developmental disabilities can be taught alongside their typically developing peers in general education classrooms within the context of the general education curriculum.

Strategies to Promote Access to and Progress in the General Education Curriculum

In the United States, amendments to the Individuals with Disabilities Education Act (IDEA; 1997, 2004) stipulate that students with disabilities are entitled to access, participation, and progress within the general education curriculum. In response, educators in the U.S. have been working to answer the following questions: What does it mean for students with special needs to have access to the general education curriculum, especially those who have who have formerly been limited to special education curricula?; How can students effectively participate and make progress in the general curriculum?; and What new tools, methods, and approaches are needed and being implemented? As Japan moves to fully implement its special needs education policy and the principles of the UN Disability Convention, the work in the US to insure access to the general curriculum mandates serve as a valuable framework for the work in Japan. Thus, in this section, first, the work on approaches to promote access to and progress in the general education curriculum for students with special needs in the U.S. will be described including a review of the work in Universal Design for Learning (UDL). Second, the related work being

conducted in Japan to teach students with learning disabilities and mild developmental disabilities in general education classrooms and applications of UDL principles will be described.

Research Trends on Promoting Access and Progress in the U.S.

IDEA (1997, 2004), with its requirement of general curricular access and mandated participation in state accountability systems, presents great challenges to both special education and general education. After IDEA, professionals were expected to balance unique curricular needs of student with disabilities with the thrust of the inclusion movement, which emphasized instruction in the general education settings. Approaches to helping students with disabilities gain access in inclusive setting, focus on adapting the curriculum to meet the needs of the students. Based on individual educational needs of the students, needed accommodations and modifications are included in their IEPs (Turnbull & Turnbull, 2004). A considerable number of studies have been conducted addressing effective adaptation strategies in general classrooms for students with learning disabilities and other mild developmental disabilities (e.g. Fuchs & Fuchs, 1998). Currently, information on research-based accommodation and modification strategies are available in a variety of resource for teachers (e.g. Karten, 2010; McLeskey, Rosenberg, & Westling, 2009) including information regarding curriculum and textbooks, the classroom environment, instruction and assignments, and possible behavior expectations.

Wehmeyer, Lance, and Bashinski (2002) present a framework for students with disabilities, especially intellectual disabilities, that describes approaches and strategies to address access to general. The approach involves three levels of action (i.e., planning, curriculum and instruction), three levels of the scope of instruction (i.e., whole school, partial school, and

individualized) and three levels of curriculum modifications (i.e., adaptation, augmentation, and alteration), which provides a multi-step and multi-model approach to ensure access for students with intellectual disabilities.

Based on the model, Lee and colleagues (2006) examined practical curriculum adaptation and augmentation strategies that might promote involvement and progress in the general education curriculum for students with intellectual and developmental disabilities. They found that in order for these curriculum adaptations to work successfully to help increase students' access to and progress in the general education curriculum, one of the indispensable factors is a high quality general education programs for all students. In the field of early childhood special education, Sandall and colleagues (2008) proposed a framework named "Building Blocks", in which they describe examples of educational practices that support and enhance the inclusion of young children with disabilities and other special needs into community-based general education preschool classrooms. The Building Blocks framework has four compartments. The foundation, a high quality program, is important for all children. The remaining blocks: curriculum modifications and adaptations; embedded learning opportunities; and explicit, child-focused instructional strategies which may be needed by some children at various points in time are built upon the foundation of a high quality early childhood program. The upper blocks become smaller in terms of the number of children in need of those supports, while the intensity and specificity of the support and practices in the upper blocks increase.

For older school-age students, Sailor (2005, 2009) proposed a model which implements school-wide response to intervention (RTI) systems for student success. The model is organized in a pyramid that has three levels of instructions, and general education and special education are

integrated at all three levels. The bottom level of the pyramid is primary interventions that are universal for all students. The middle level is secondary interventions for some students at risk. The top level of the pyramid is composed of tertiary interventions for individual students. The most intense and specific interventions are implemented at the top level.

Research on Universal Design for Learning in the U.S. As evidenced, the general education curriculum itself has been evolving such that it is now seen as a foundation for all students including students with special needs (Hitchcock, Meyer, Rose, & Jackson, 2002). Universal design for learning (UDL), a relatively recent trend, posits that the curriculum should be designed from the beginning to incorporate the diverse needs of all students. Thus, UDL decreases the need for adaptations and modifications to the curriculum after it has been developed (Hitchcock, Meyer, Rose, & Jackson, 2002; Rengzalia, Karvonen, Drasgow, & Stoxen, 2003). A universally designed curriculum provides flexible means of representation, expression, and engagement in order to make the curriculum accessible to the broadest array of learners (CAST, 2008). The premise behind UDL is that barriers to accessing the curriculum are reduced while simultaneously ensuring that the curriculum is appropriately challenging for each student (Orkwis, 2003).

IDEA (2004) recognizes the term *universal design* according to Section 3 of Assistive Technology Act (1998). The act states that universal design “is a concept or philosophy for designing and delivering products and services that are usable by people with the widest possible range of functional capabilities, which include products and services that are directly usable (without requiring assistive technologies) and products and services that are made usable with assistive technologies ”(pp.8-9). It is noteworthy that the recent reauthorization of the Higher

Education Opportunity Act (2008) defined universal design for learning as follows:

(24) UNIVERSAL DESIGN FOR LEARNING- The term universal design for learning means a scientifically valid framework for guiding educational practice that

(A) provides flexibility in the ways information is presented, in the ways structures respond or demonstrate knowledge and skills, and in the ways students are engaged; and

(B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.

Thus, it seems that the definition of universal design evolved from a concept in 1998 to a scientifically validated framework in 2008.

Spooner and colleagues (2006) stated that since the concept of UDL has relied heavily on the use of computer technology and ensuring access, other aspects of UDL in the classroom have not been adequately addressed. Specifically, UDL research has tended to and often still does focus on the assessment of UDL needs for students (e.g., Ketterlin-Geller, 2005; Russell, Hoffman, & Higgins, 2009). However, strategies for applying assessment of UDL principles are becoming increasingly prevalent in instructional planning for the content areas of science (e.g. Dymond, Renzaglia, Rosenstein, Chun, Banks, Niswander, & Gilson, 2006), reading (e.g. Meo, 2008), and mathematics (e.g. Kortering, McClannon, & Braziel, 2008), and in these studies, not only technology use, but also other aspects of UDL have been addressed. Furthermore, research efforts have targeted a broad array of learners including those with mild learning issues to those

with more severe disabilities (Browder, Mims, Spooner, Ahlgrim-Dezell, & Lee, 2008; Dymond et al., 2006).

Teacher training efforts is another important area in UDL research. Researchers have investigated the effectiveness of instructing preservice and inservice teachers how to incorporate components of UDL into their classrooms and their lesson plans (Dymond, et al., 2006; Evans, Williams, King, & Metcalf; 2010; Spooner, Baker, Ahlgrim-Dezell, Browder, & Harris, 2007; Van Laarhoven, Munk, Lynch, Bosma, & Rouse, 2007). Using a case study methodology, Dymond and colleagues (2006) examined the process of redesigning one high school science course to incorporate the principles of UDL. The noteworthy aspect of this study is the fact that they used a participatory action research approach, and the researchers introduce UDL principles to teachers who were not at all familiar with the strategies. The redesigning process involved the teachers having to make changes to the curriculum, their instructional delivery, the organization of their learning environments, the expectations of student participation, the materials, and the assessments they used. The report of the experiences of the school personnel involved in the study suggests that universally designing high school science courses can have positive benefits for students both with and without disabilities, as well as for the teachers who engage in the change process even if support for changes was required by the teachers.

Research on approaches to teaching students with learning disabilities and mild developmental disabilities in general education classrooms in Japan. As noted previously, several years have passed since Japanese new policy of special needs education came into operation. The policy clearly addresses meeting special educational needs of students with learning disabilities and other mild developmental disabilities (e.g. students with ADHD, high

functioning autism, mild emotional disturbance, and mild intellectual disabilities) in the general education classroom, and efforts have been made to promote their access to and progress in the general education curriculum. On the other hand, even under the new system of special needs education, students with moderate to severe intellectual disabilities studying in special needs classrooms and special needs schools are still in the special education placement with a specialized curriculum. The new framework of special needs education, constitutionally, does not assure access to and progress in the general education curriculum and classroom for students with more substantial or significant disabilities, as is the case in the US. Consequently, the present study focuses on, as does the Japanese special needs education policy, approaches to teaching students with learning disabilities and mild developmental disabilities in general education classrooms.

In 1992, long before the effectuation of the new policy, the Japanese Academy of Learning Disabilities was established as an academic society to focus on the education of students with learning disabilities and other developmental disabilities. Since then, research on effective strategies for teaching students with learning disabilities and other mild developmental disabilities has increased and is being disseminated to provide practical information for teachers. Prior to the policy change, however, researchers and teachers tended to focus on assessment and individualized instructions in pull out settings for these students. Few studies focused on the larger ecological aspects of teaching these students in the general education classrooms.

Some researchers adapted practices in the United States to address the needs in Japan. For example, based on the concept of response to intervention (RTI) developed in the U.S., Kaizu (2008) developed a Multi-layer Instruction Model (MIM) in which students are identified

as at-risk for failure in their reading skills, provided specialized instruction. Their progress is then monitored. MIM was specifically designed to be implemented in first grade classrooms so that all students are screened for potential reading concerns. As soon as a student is determined through the screening to be at-risk in reading skills, he/she receives specialized instructions to build up their reading skills to a pre-determined level of proficiency in order to prevent failure. Others have introduced and adapted for Japanese schools the concepts of positive behavior support and social skills trainings as developed in the US (can you give a citation here?). To date, however, this work has focused on using these practices as a supplementary or secondary intervention for students at-risk for school failure rather than as a primary intervention for students with identified learning disabilities or mild developmental delays.

NISE (2005) conducted a survey to assess the current status of the provision of instructional supports for elementary-level students with learning disabilities and other mild developmental disabilities in general education classrooms. In this survey, elementary general education classroom teachers were provided a list of a variety of instructional supports for students with learning disabilities and other developmental disabilities. Teachers were then asked the following questions; 1) Which instructional supports do you believe are easy to provide in your classroom?; 2) Which of these instructional supports do you provide to students and/or use in your classroom?; and 3) What additional resources or support do you believe need to be in place for you to provide these instructional supports? The teacher responses documented that many teachers feel uncomfortable providing individualized instructional supports in their classrooms (e.g. providing special note sheet for large print, utilizing tips-sheet to solve questions), but they do feel comfortable providing instructional supports for their whole class

(e.g. raising motivations as a group, promoting appropriate behaviors for all students). In addition, many teachers reported feeling that it can be difficult to prepare special instructional materials to support an individual student's learning. There were some teachers who reported feeling comfortable providing most of the instructional supports on the list. However, they noted that they tend to provide these supports not to specific individual students, but rather to the whole class. Finally, the majority of teachers reported that they believe that they would be able to provide more instructional supports to their students with special needs if they had one or more of the following resources and/or supports: additional time, additional staff, specialized instructional materials, and/or common understanding with other teachers.

The concept of universal design for learning (UDL) has recently been introduced into elementary schools and junior high schools in Japan (Hirose, Katsura, & Tsubota, 2009; Hino-city Board of Education & Ono, 2010). Hirose and colleagues (2009) in their book titled *Universally designed lessons conducted by general education classroom teachers*, clearly describe the strategies to use for creating lessons for all students by adapting special needs education strategies and implementing them in their lessons for their general education students. The Hino-city schools in collaboration with Ono (2010) published a book, which provides many case examples of implementation of a range of instructional supports in the general education classrooms with a primary focus on universal intervention for all students. Both of these books have been promoted as very credible given that they are based in the real world of general education teachers in public elementary and junior high schools in Japan (e.g. 650 teachers in 25 public elementary and junior high schools - Hino-city Board of Education & Ono, 2010).

Although the specific term, UDL, is new to Japanese teachers, the concept itself seems

to be familiar to the school culture in Japan. In order to create a school environment in which general education and special needs education work together collaboratively, UDL may well hold the key for providing the teachers with strategies for ensuring that all students have access to the curricular content and can learn.

CHAPTER 2

Statement of the Problem

This chapter describes challenges encountered by elementary school classrooms in Japan as they work toward implementing the “special needs education” policy and proposes solutions to address the challenges. Specifically, the challenges as described in chapter one will be briefly summarized. Next, the potential strategies for addressing the challenges will be presented with a focus on the use of UDL strategy. Some special considerations regarding application of UDL strategies within the context of Japanese classroom culture will be explained. A proposed model for applying UDL to Japanese classrooms will then be proposed. Finally, research questions for this study will be stated.

Challenges in Schools and Classrooms in Japan

As described in chapter one, the educational policy of “special needs education” in Japan has presented challenges to general education teachers who were not prepared to work with students with disabilities. One of the objectives of the policy is to ensure that the educational needs of students with learning disabilities and other mild developmental disabilities are met in the general education classrooms. These students had not been provided educational supports and/or services officially in the previous policy. In other words, students with learning disabilities and other mild developmental disabilities (e.g. ADHD, high-functioning autism) were newly added to the eligibility categories for Special Needs Education. It is important to note that these students were already attending general education classrooms long before the new policy but most general education teachers considered them as having disabilities. As stated in the previous chapter, the new policy could possibly lead to students who have difficulties in

learning and behavioral issues being more readily identified and diagnosed with a learning disability, ADHD, or autism spectrum disorders, and then being more easily removed from the general education environment to a special classroom with a specialized curriculum. The developers of the new policy, however, did not want to see this as the outcome.

In order to support students participation and learning and mild developmental disabilities within the general education classroom, the government has promoted the establishment of a consultative conference system within each school, provision of a special needs education coordinator for every school, the required development of individual education plans, the use itinerant consultation, and implementation of in-service training for general education teachers. MEXT (2008) reported based on its investigation that close to 100% of all elementary schools have established consultative conference system within their schools, and assigned a special needs education coordinator to support students with learning and mild developmental disabilities to be successful in the general education classroom. In addition, 82% of schools reported developing individual education plans, 77% of schools reported use of itinerant consultation, and 64% of schools have implemented in-service training for teachers.

A study conducted by NISE (2007) found that implementation of the new policy has resulted in the majority of elementary schools understanding the necessity of special needs education being provided within the general education classrooms and working with their administrators and teachers to develop common beliefs and understanding regarding the importance of and how to support students with learning and mild disabilities in their schools. However, only 30% of schools reported that teachers have made substantial changes to their lesson with an eye toward supporting the concept of special needs education. In addition, 60% of

schools reported that their teachers don't know how to provide appropriate teaching methods for students with learning and other mild developmental disabilities within their general classrooms.

The findings of another NISE study (2005) suggests that the traditional Japanese school culture may have a negative influence on provision of individualized instructional supports within general education classrooms. That is, many Japanese teachers feel uncomfortable about providing individualized instructional supports in their classrooms (e.g. providing special note sheet for large print, utilizing tips-sheet to solve questions), but have no problems when instructional supports are provided for the whole class (e.g. raising motivations as a group, promoting appropriate behaviors for all students). These findings suggest that teachers may be struggling in teaching students with special needs in their classrooms alongside with their typically developing peers in general education classrooms within the context of the general education curriculum in part because of culturally held beliefs. Although teachers need practical information to modify their lessons and teaching to accommodate a broader range of learning needs, it seems that the use of itinerant consultation system and the implementation of in-service training have not yet fully addressed the challenges. Also, the traditional Japanese school culture may be interfering, in part, with the full implementation of individualized instructional supports within general education classrooms.

Ways to Address Current Problems in Japan

A potential solution, as noted earlier, to addressing the current educational challenges in Japan is to apply the strategy of universal design for learning (UDL). The concept of UDL posits that the curriculum should be designed from the beginning to incorporate the diverse needs of all students (Hitchcock, Meyer, Rose, & Jackson, 2002; Rengzalia, Karvonen, Drasgow, & Stoxen,

2003). The premise behind UDL is that barriers to accessing the curriculum are reduced while simultaneously ensuring that the curriculum is appropriately challenging for each student (Orkwis, 2003). In the U.S., research has been conducted to assess the effects of implementation of UDL strategies in the general education classrooms in promoting access and progress in general education curriculum for students with special needs as well as writing to refine strategies for implementation by educators (e.g. Dymond et al., 2006).

Applying UDL strategy to Elementary Classrooms in Japan. The strategy of UDL which has been developed in the U.S. can be implemented by Japanese elementary teachers for teaching students with special needs in their classrooms alongside their typically developing peers in the general education classroom. This can counteract the trend of increases of special classroom placements of students with learning disabilities and other mild developmental disabilities, and support their access and progress within the context of the general education curriculum.

Very recently, books for teachers regarding universal design for learning have been published in Japan (Hirose, Katsura, & Tsubota, 2009; Hino-city Board of Education & Ono, 2010), but very few Japanese elementary teachers are familiar with the concept of UDL. In order to support students with special needs within the general education classrooms, the UDL strategy can be introduced to Japanese elementary teachers as a practical, feasible approach to improving their lessons.

Considerations for Applying UDL to Elementary Classrooms in Japan. A number of issues, however, need to be taken under consideration in planning for applying and introducing the UDL strategies into Japanese elementary classrooms including: 1) addressing fit

with cultural instructional beliefs; 2) supporting an understanding of UDL as a primary level of instructional support; 3) understanding of factors that will arise for teachers as they move through the process of change for adoption of an innovative; and 4) addressing the importance of facilitating teachers' reflection. Explanations of these considerations are below.

Fits with Cultural Instructional Beliefs. Recently, in the field of special needs education in Japan, more and more verified strategies developed in western countries, including the U.S., have been introduced. Ohtake and Wehmeyer (2004) suggest that when professionals introduce theories and practices that have a different cultural background than their own culture, they must explore the cultural values embedded in both the non-native practice they wish to use and the educational practices of their native culture. This process enables professionals to identify similarities and differences between the value systems inherent in each set of practices. Identifying similarities allows the professionals to supplement existing theories and practices in their culture while noting the differences ensures attention to the need for modifications and adaptations to the practice to avoid possible negative influences or cultural clashes that might result from the introduction of the foreign practices.

As to applying UDL strategy to elementary schools in Japan, existing values in current educational practices in Japan can't be ignored. The NISE study (2005) revealed that many teachers feel uncomfortable providing individualized instructional supports to some students in their classrooms, but feel comfortable providing instructional supports as long as they are provided for whole class. This may reflect the values of group dynamics and sense of community, which Japanese teachers have traditionally held (Akita & Lewis, 2008).

There might also be some similarities or "fit" between the values in Japanese

elementary classrooms and those in UDL principles. Specifically, with the use of UDL, the need for adaptations and modifications to the curriculum may decrease, since the needs of all learners are considered from the very beginning in the curriculum (Hitchcock, Meyer, Rose, & Jackson, 2002). This UDL principle has the potential of being a good “fit” with Japanese elementary teachers’ instructional beliefs. There is a possibility that even in traditional elementary schools in Japan, some highly capable general education teachers had implemented the curriculum in which supports for the needs of all learners are naturally embedded by utilizing group dynamics and sense of community.

On the other hand, there are obvious differences between the values in Japanese elementary classrooms and in the UDL principles, since the UDL principles have been developed within the western culture in which value systems are based on the concept of individualism (Ohtake & Wehmeyer, 2004). One of the biggest differences, for example, is providing options. A UDL curriculum provides flexible means of representation, multiple means of expression, and multiple means of engagement to meet individual needs and interests. Japanese teachers might get bewildered by the value of providing options to their students in their elementary classrooms.

It is not clear that Japanese teachers will be willing and able to effectively modify their current teaching approaches to implement UDL principles. There is a need to investigate how the principles of UDL can be appropriately applied to the Japanese elementary classrooms and how these curriculum supports are implemented within classrooms.

Focus on the primary level of support. In the U.S., a variety of models and theories have been developed in order to explain how to support students with special needs in the general education curriculums (e.g. Wehmeyer, Lance, & Bashinski, 2002; Sailor, 2009). For

example, the model by Sailor (2009) is organized in a pyramid, which has three levels of instructions, and general education and special education are integrated at all three levels. The bottom level of the pyramid is primary interventions that are universal for all students. The middle level is secondary interventions for some students at risk. The top level of the pyramid is tertiary interventions for individual students. The most intense and specific interventions practice is implemented at the top level. Other models would agree with the premise that high quality general education programs for all students are indispensable factor to support students' access to and progress in the general education curriculum (e.g. Sandall et.al, 2008).

Unfortunately, in Japan, the introduction of the new policy of special needs education tended to focus on specific disability characteristics of students with LD, ADHD, Autism spectrum disorder, and so on. The new policy requires general education teachers to provide individual instructions to students with LD and other mild developmental disabilities in general education classrooms, without focusing on quality of general education programs. Applying the UDL strategies should be understood by teachers that its focus is not on the students with LD and other mild developmental disabilities only, but on all students in the classrooms, which is called the primary level of support. In order for general education teachers to understand the concept, some training and preparation may be required.

Process of innovative change in education. In the U. S., innovative change in education has been analyzed and documented by researchers in general education (Fullan, 2001). Fullan described three phases for innovative change in education: (a) initiation, (b) implementation, and (c) institutionalization. It is reported that teachers play important roles in implementing innovation. Several facilitated factors are reported; professional development is key, evaluation

is critical (monitor implementation as carefully as gains in student achievement), and the quality of working relationships among teachers is strongly related to implementation (Fullan, 2001).

Applying and introducing the UDL strategies into elementary classrooms in Japan is huge innovative change in education. Teachers play important roles in implementing innovation, and appropriate supports for their professional development should be provided to them. Their implementation of UDL strategies would be monitored and encouraged, with understanding of their colleagues. The last stage, institutionalization of UDL principles in the elementary classrooms and the whole schools, should be aimed.

Importance of facilitating teachers' reflections. In this study, general education teachers are the key to implementation of innovative change, applying UDL strategies into their classrooms. It is very important for general education teachers to feel ownership of all the students in his classrooms, including students with LD and other mild developmental disabilities. It is expected that general education teachers would take the initiative in solving problems and focusing on improvement of the primary level of support for all students in the classrooms.

In order for classroom teachers to take initiative in applying UDL strategies, and further, to feel comfortable to implement as their own skills, facilitation for teachers' self-reflection is very important. Reflection-in-action is defined by Schön (1983) as the ability of professionals to 'think what they are doing while they are doing it'. He regards this as a key skill for professionals. He asserts that the only way to manage the 'indeterminate zones of (professional) practice' is through the ability to think on your feet, and apply previous experience to new situations. This is essential work of the professional, and requires the capability of reflection-in-action. Teachers should be 'reflective practitioners', and not 'technical experts'.

UDL strategies should not be introduced just as techniques for teachers to use. Teachers will be encouraged to think reflectively how these strategies can be incorporated into their practices in order to solve various educational problems in their own classrooms.

Proposed Model to Address Challenges

Looking at four issues above, there is a need to investigate how the principles of UDL can be appropriately applied to the Japanese elementary classrooms and how these curriculum supports are implemented within classrooms. Teachers may need appropriate supports for understanding and implementing UDL principles, and the process of their adoption of UDL strategies into their teaching practice would be carefully monitored. Since implementation of UDL principles might represent a significant change to the current educational practice in Japan, there is a need to examine and understand various aspects of the change process experienced by Japanese teachers, including their changes in values.

A proposed model for solution is consultation approach. That is, the investigator would provide information, training, and support to the teachers as they add UDL principles to their curriculum as instructional approach in their lessons. In addition, teachers' self-monitored tool was developed to allow the teachers to review their own teaching practices and their progress towards implementing their individualized UDL target strategies. This may facilitate teachers' self-reflection.

There is another reason for taking the consultation approach in this study. In order to support students with LD and other developmental disabilities in general education classrooms, Japanese government has promoted schools to utilize itinerant consultation and to implement in-service training for general education teachers. Examining effectiveness of the consultation

approach in this study may be able to provide valuable information for itinerant consultation and in-service training for general education teachers.

Research Questions

The goal of this study is to describe the process and experience of Japanese elementary teachers as they work to address a policy change and implement the curricular innovation of UDL principles within their math curriculum. A qualitative case study approach (Merriam, 1998; Yin, 1994) will be employed for the investigation. Specifically, the process of planning for and implementing the principle of UDL by the teachers of three general education early elementary mathematics classrooms in Japan will be examined.

The following three broad questions will be addressed in this study: (a) What are the impacts of the consultation on teachers in terms of changes in teaching practice regarding UDL? ; (b) What barriers and facilitators to adopting and implementing the innovation of UDL do the teachers report experiencing? ; and (c) What are the impacts of implementing UDL principles on student outcomes ?

CHAPTER 3

Methods

The purpose of this research is to examine the process and experience of Japanese early elementary general education teachers as they are trained through a consultative approach to implement the curricular innovation of Universal Design for Learning (UDL) within their math lessons. A qualitative case study approach (Merriam, 1998; Yin, 1994) was used to address the research questions. This chapter describes the research design, description of participants and setting, data collection methods, and data analysis procedures used in this study.

Research Design

In this study, the Japanese teachers' process and experience implementing an innovative instructional change was analyzed. A qualitative case study approach (Merriam, 1998; Yin, 1994) was chosen for the investigation because of the exploratory nature of the work.

Furthermore, the researcher noted that this method would allow for the greatest flexibility in how the teacher moved through the change and the collection of relevant sources of information for understanding the range of differences as well as similarities in which teachers progressed through the experience. A case study approach relies on multiple methods of data collection to capture the complexity of processes and outcomes. Merriam (1998) defined qualitative case study as "an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p.27) and suggests that a case study is a particularly suitable design if one is interested in the monitoring of process. Also, in summarizing the importance of a process rather than an outcome as justification for selecting a case study, Merriam writes that case studies enable one to understand processes of events, projects, and programs and to discover context

characteristics that will shed light on an issue or object.

A multiple case study was also a part of the design. According to Yin (1994), multiple case studies have the potential to produce evidence that is more compelling and robust than single case studies. Multiple cases follow replication logic much like multiple experiments and replication is said to have occurred if similar findings are obtained from several cases.

Furthermore, multiple cases allows for an initial look at the variability that will occur from one case to another as they move through similar processes and thus allow for even greater understanding of the process.

Setting and Participants

The three participant classrooms for the study were drawn from two elementary schools. Two classrooms were from S School in Kaiyo town in Tokushima prefecture, and one classroom from H school in Ritto city in Shiga prefecture. Specifically, two general education classrooms (i.e., Grade 1 & 3) from S School (i.e., Case 1 & Case 2), and one general education classroom (i.e., Grade 3) from H school (i.e., Case 3) served as the intervention classrooms.

Case 1 and Case 2. The two classrooms constituting Case 1 and Case 2 are from S school in Kaiyo-town. Kaiyo-town is a rural fisherman's village with a population of approximately 12,000 people. About 180 students and 16 general education teachers work and learn at S School with only one classroom for each grade level. This school was selected as a participant school because it was anticipated that it would be relatively easy to observe the impact of the intervention in such a small, rural school. In addition, the school's principal, who had preparation in special needs education, expressed a strong interest in the project and had indicated a willingness to work with the investigator and to provide support for her staff in

participating. Furthermore, given the heuristic nature of the research project, it was felt that the collaborative atmosphere noted throughout the school and across the personnel of S School would be an asset to successful implementation.

Four general education teachers, one teacher from a special needs education class, approximately 60 elementary students, and the school's principal constitute the actual participants across the two classrooms (i.e., Grade 1 & 3). Within each classroom, two general education teachers co-teach the math lessons, with one serving as the lead teacher and the second as a support teacher. Approximately 30-35 students are enrolled in each classroom; and according to the teachers, 6-10 % of the students in each class appear to be in need of additional supports in order to make meaningful progress in the curriculum content. Some of these students have diagnoses such as learning disabilities, attention deficit disorder, or developmental disabilities, while others do not have an identified disability.

Although none of the teachers in the S School have teacher's certification or licensure in special needs education, there are two classrooms within the school providing special education support. One of the classes is a self-contained special needs education class while the other is a special supplement class. However, neither of the teachers serving these special education classrooms have special education certificates either. Several students from the participating classrooms are provided support through the supplement class or special needs education class for specific times during the school days, but they study math in the general education classroom.

Case 3. The class for Case 3 is part of the H school in Ritto-city. Ritto city is the suburb city of one of the nation's largest metropolitan areas with a population of approximately

63,000 people. About 390 students and 25 general education teachers work and learn at H School. This school was selected as a participant school because after the completion of the investigation at S school, which was located in rural area and relatively small school, there was a need to observe the impact of the intervention in a school in a large urban setting. In addition, the board of education for Ritto-city expressed interest in the project and had indicated a willingness to work with the investigator and support elementary teachers at Ritto-city in participating. In addition to the participant teachers from H school, 10 elementary teachers from Ritto-city also participated in this project as a focus group member in the process of developing a checklist designed to guide teacher implementation of UDL.

One general education teacher (grade 3), one special needs teacher, 32 3rd grade students from one classroom, and the school's principal constitute the actual participants. According to the teachers, 15 % of the students in each class appear to be in need of additional supports in order to make progress in the curriculum content. Two of these students have diagnoses of learning disabilities, and one student from Brazil is learning Japanese. The classroom teacher does have teacher's certification in special needs education. Two students from the participating classrooms are provided support through the supplement class for specific times during the school days, but they study math in the general education classrooms.

The participating classroom teachers employed a traditional Japanese instructional style within their math lessons, which emphasized whole group lecture and seatwork. All students' desks are in orderly rows, facing the teacher's platform, with the blackboard at the front of the classroom. Since the students are early elementary level, some hands-on activities are prepared in order for students to be able to better understand concepts as they are first introduced.

Consultation Participants. In addition to the investigators [i.e., a doctoral student at University of Kansas and researcher at Japan's National Institute of Special Needs Education (NISE)], another researcher from NISE, who has content expertise in teaching elementary math, served as a consultant to the school staff as they implement the changes. The lead investigator (the author) had primary responsibility for facilitating the consultation meetings, providing strategies and instruction regarding the application of UDL, and collecting and analyzing data. The second researcher from NISE provided support through specific suggestions and strategies regarding the math content and instructional principles, and assisted with individualization of math instruction for specific students with special needs as needed.

Procedures

Intervention. The training and preparation of the teacher in the UDL intervention was conducted using a consultation approach. That is, the investigator provided information, training, and support to the teachers as they added UDL principles to their instructional approach in their math lessons. In addition, a teachers' self-monitored tool was developed to allow the teachers to assess their own teaching practices and their progress towards implementing their individualized UDL target principles. Both the consultation model and the self-monitoring tool are described in detail in the following sessions.

Consultation approach. The study was conducted using a consultation approach designed to support the general education teachers in adopting and implementing a UDL approach to their math curriculum and instructional methods. The consultation was provided by two researchers from Japan's NISE, one of which is the investigator. Since the implementation of the new policy of Special Needs Education was still in the early phases at the time of the study

(i.e. April 2007), many general education teachers were eager to learn how they could support students with special needs in their general education classrooms. They expected that researchers from NISE would be available to them and would consult with them to address the expectations of this new policy. The investigator explained to the participating teachers that the consultation would focus on not only instructions for students with special needs themselves, but also improving teaching practices for all of the students in their class. Thus, the focus was on how they could create mathematics lessons that would meet the diverse needs of all their students.

The ultimate anticipated outcome of the provision of the consultation was that the teachers would be able to set goals, make decisions, and solve problems regarding implementation of UDL as a part of their math instruction. Components of the “Self-Determined Learning Model of Instruction” (Wehmeyer, Palmer, Agran, Mithaug & Martin, 2000) were applied to facilitate the teachers learning of the UDL intervention. Specifically, the teachers were expected to review their own teaching practices within their math lessons from the viewpoint of UDL, set objectives and plans for improving their UDL teaching practices, implement the plan in their math lessons, and monitor their own progress towards their own learning objectives.

Self-monitoring tool. A tool, “Checklist for Teaching Practice”, to assist in the application of UDL in Japanese general education classrooms, was developed by a team from NISE under the leadership of the investigator. The tool is an adaptation of the work of Dymond and colleagues (2006). Specifically, Dymond and colleagues, through a Participatory Action Research Approach, introduced UDL principles into a high school science course. They identified five core areas as critical for ensuring full implementation of UDL, and created a set of questions under each of the core areas for teachers to consider as they address implementation of

UDL. Dymond and colleagues five core areas are (a) curriculum, (b) instructional delivery/organizations of learning environments, (c) student participation, (d) materials, and (e) assessment. The “Checklist for Teaching Practice” used in this study was developed by modifying the questions for the five areas provided in the work of Dymond and colleagues.

In order to finalize the checklist items, the investigator asked 10 Japanese elementary teachers in Ritto-city, Japan to use the initial version of the checklist. A focus group was then held with these teachers in order to obtain their input and finalize the items with a particular focus of ensuring that the items are acceptable to Japanese elementary teachers and reflect their cultural values. The checklist was then revised based upon the focus group input. The format and usefulness of the checklist as a tool for guiding the consultation process also needed to be assessed. Toward this end, the investigator piloted the revised checklist in an early elementary classroom in S school. Four primary concerns were noted: (a) some items on the checklist might be difficult to understand; (b) the instructions on the checklist were unclear; (c) the relationship between the checklist, the other forms, and the full process of implementation was not clear; and (d) completing a self-reflection memo for each math class session was viewed as potentially difficult in terms of teacher time.

Reflecting on the concerns noted above, four modifications have been made to the initial checklist and other forms, which include: (a) the order and the grouping of the items on the checklist were modified so that teachers can grasp the meaning more easily; (b) more detailed explanations were added to the instructions; (c) each step in the process of implementation of UDL, including the checklist and other forms, is now presented to teachers in a flow chart to facilitate their understanding; and (d) a recording form was combined with the self-monitoring

GAS form such that there was only one form, thus reducing the demand on teacher time. The final version of the tool, “Checklist for Teaching Practice”, is available in Appendix A.

Study Phases

Baseline phase. The investigator visited the participating classrooms 3-4 times prior to implementation of consultation and training on UDL to observe and videotape their mathematics lessons. The “Checklist for Teaching Practice” tool was used as an observational guide. In addition, the investigator conducted a semi-structured interview with teachers of the participating classrooms about their current teaching practice.

Planning Meeting. Just before the intervention phase, the investigator and the teachers had a planning meeting. The school principal attended the meeting and gave suggestions if necessary. The teachers of the participant classroom were asked to fill out three documents. The first one was the “Checklist for Teaching Practice”. By checking each item, respondents were guided to review their own teaching practice from the viewpoint of the principles of UDL. They were to indicate if they were implementing the item. Then, if they responded that they were implementing the item, they were to indicate if they thought that their current implementation was successful or not. After having reviewed their teaching practice and current classroom situation from the perspective of UDL principles, they were to note, which practice items they would like to learn or improve.

The second form completed during the planning meeting was called the “Review Sheet for Your Practice” (see Appendix B). For this form, the teachers were asked to select the 10 items from the previous “Checklist” that they believed that they using most effectively and most closely to the manner in which it was intended. They were then asked to briefly describe in

concrete terms how and what they actually did in implementing the item. The purpose of the form was to support the teachers in reflecting on their own teaching practice and to better understand what they consider to be important in their teaching practice and to self identify their own strengths from the viewpoint of UDL. In addition, as a consultant the investigator was then able to better understand the teachers' values and level of commitment for implementing UDL.

In consultation with the investigator, the teachers each selected their own objectives to focus on in the coming two months consultation period (i.e. intervention phase). The objectives might be the items or combination of the items from the checklist that they had identified earlier as wanting to learn or in which they wish to improve their skills. Each teacher selected two to three learning objectives.

The third form used in the planning meeting was the "Worksheet for Your Objectives" (see Appendix C). By utilizing this form, the teachers and the investigator collaboratively made plans regarding how the teachers could achieve their objectives. The expectation was that the task of achieving the objective would be broken down into smaller steps. The investigator was careful to incorporate the teachers' beliefs about teaching and their teaching strengths as the learning steps were identified and described.

Based on the contents of the "Worksheet", the team, teachers and the investigator, collaboratively developed the criterion scales for the Goal Attainment Scales (GAS). The completed GAS for each team then served as the criterion-referenced approach for assessing the level of changes achieved in the academic and social behavior of the students (Roach & Elliot, 2005). The basic methodology of GAS involves the following steps: (1) select target behaviors; (2) describe the desired behavioral outcome in objective terms; and (3) develop five descriptions

of the probable outcomes from “least favorable” to “most favorable”. In this study, GAS techniques were also used as a method for monitoring the teachers’ progress in targeting teaching behaviors. (See Appendix D for an example of GAS scale and record form).

Intervention phase. After the baseline phase and the planning meeting, each of the participant classrooms moved in turn into a two-month intervention phase. That is, Case 1 (i.e., 3rd grade class in S school) moved into the intervention phase first, followed by Case 2 (i.e., 1st grade class in S school), and then Case 3 (i.e., 3rd grade classroom in H school) was conducted. Case 2 and Case 3 started after the 2- month intervention phase of the previous case was finished.

During the 2-month intervention phase the classroom teachers followed the intervention plan that had been developed in the previous phase for achieving the targeted objective in their mathematics class. The investigator observed the math class weekly (i.e., direct observations with videotapes or only videotapes) and consulted with the teachers (i.e., face to face meeting or telephone conference). Consultation and discussion between the investigator and the teachers focused on ways in which they had incorporated or could better incorporate the identified UDL steps and their personalized objectives for implementation of UDL into their math lessons. In addition, the collaboration meetings were used to discuss and work through to resolve unexpected issues that arose and general questions regarding the teaching and learning process. During each consultation meeting, the teachers’ progress towards achieving their objectives was assessed using the GAS tool and the data was then added to the teacher’s graph. If there was no progress towards meeting the objectives for two or more weeks, the intervention plan, objectives, and the criterion-referenced GAS scale were reexamined with adjustments made as needed. On

occasion the school principal joined in for part of the consultation meeting. The intervention phase lasted just 2 months for each class, which had been agreed upon between the schools and the investigator when they agreed to participate in the study. Knowing the duration of the intervention phase, the schools and the teachers were able to fit study participation in their annual schedule, which seemed to be an important condition for these Japanese schools.

Post intervention phase. At the conclusion of the intervention phases, the teachers participated in a follow-up semi-structured interview to determine their perception of the process of consultation focused on applying the principle of UDL. In addition, the teachers were asked to complete “Checklist for Teaching Practice” again, and their math class was observed to see if they implemented learned UDL principles after the intervention phase.

General Data Analysis Procedures

A content analysis procedure (Merriam, 1998) was used to initially analyze and organize the written data. Each data set (e.g., teachers completed checklist, consultation meeting minutes) was analyzed separately using the same process. The data was read to identify units of meaning related to the teachers’ application and use of UDL principles. The investigator then coded each “unit” as to the specific meaning conveyed. As the coded unit began to accumulate, the investigator began developing interpretations and an analysis of emerging themes. These themes were tested on additional “units of meaning” to further refine and define meaningful themes. This process, known as the constant comparative method (Lincoln & Guba, 1985; Merriam, 1998), was used to develop codes and categories of codes and allowed for the sorting of the raw data into meaningful themes and patterns. Based on interpretations and an analysis of defined themes, a case summary was developed for each of the participants. The findings from

the first case summary were compared with the findings from the second case summary, and then similarities and differences between the two cases were analyzed. Then, the third case summary was compared with the findings from the previous cases, and new findings were developed. This procedure, a multiple case study approach, enables an richer understanding of the processes involved in introducing UDL principles into Japanese early elementary classrooms and fully understanding the consistent patterns across implementation as well as unique issues that arose to discover unique context characteristics.

An initial write-up for each of the participants (case summary) of the categories and findings was developed and given to all of the respondents for the purpose of providing member checks (Merriam, 1998). Additionally, the coded materials and findings underwent peer examination. That is, an additional researcher reviewed the coding process, data that were coded, and findings to ensure that the process and findings were viewed as valid.

Teacher change data collection and analysis. Eight primary items provided the data for assessing teacher change. They are: (a) semi-structured pre-and post-interview; (b) teacher completed “Checklist for Teaching Practice”; (c) teacher completed “Review Sheet for Your Practice”; (d) “Worksheet for Your Objectives,” which was developed collaboratively by teachers and researchers; (e) consultation meeting minutes; (f) GAS scale monitored by teachers and researchers; (g) teachers’ implementation records; and (h) videotapes of mathematics classes. Each is briefly described below. The analysis procedures for each of these data sources are explained in the following sections.

Pre-intervention interview and post-intervention interview. As noted in the procedures section, a semi-structured pre-intervention and post-intervention interview was conducted with

each of the teachers. Interview guides were developed to keep the interview format consistent. Guiding questions helped ensure that all participants had similar opportunities to share information. This type of interviewing was used to ensure that specific information was gathered, however, the particular phrasing and order of questions varied according to the direction and flow of the individual interview. The interview guides were designed to facilitate the interview but not to control the interview process (Arksey & Knight, 1999). Additional follow-up questions or probes were asked if further information or clarification was deemed necessary for a specific question or in response to something a respondent stated.

The pre-intervention interview guide included the following guiding questions: (a) What are some important aspects of your current teaching practice?; (b) What are some challenging issues or concerns relevant to your teaching practice?; and (c) How are you supporting students with special needs in your classroom? Whereas, the post-intervention guide included the following questions (a) What have you learned about curriculum and instruction as a result of our work together? (b) Were there any positive outcomes for students (if so, what)? (c) Were there any negative outcomes for students (if so, what), (d) What parts of the process were the most helpful/useful, and (e) Are there things the researchers could have done differently to make things work more effectively?

Each interview occurred in the school principal's office and required approximately one hour to complete. All interviews were audiotaped, such that the data were able to be preserved in its original state for analysis (Merriam, 1998) and thus increase the accuracy and accessibility of the information collected during interviews (Seidman, 1991). Verbatim transcripts were developed for all audiotaped interviews. Field notes were also be utilized to supplement the

audio files of the interview session and facilitate accuracy of transcripts. Transcripts underwent member checks, which consisted of each participant reviewing their transcript for accuracy and providing corrections and/or clarifications as they deemed necessary (Merriam, 1994). The data (i.e., transcripts) were analyzed utilizing content analysis procedures described previously in order to understand the teachers' experiences and their perception of changes that they had made in their teaching and use of UDL.

Checklist for teaching practice. Prior to the planning meeting, teachers were asked to complete the "Checklist for Teaching Practice" form. Using the form, teachers were asked to assess their current teaching practice from the perspective of the use of UDL principles, and then select one or a couple of principles that they would like to target for improvement in their teaching. The teacher completed checklists were used to guide the discussion at the planning meeting. The teacher's responses to items on the checklist were summarized to provide an index of each teachers' initial perception of their own teaching practices, particularly in terms of the use of UDL, and their orientation for improvement.

Review sheet for your practice. After completing the "Checklist for Teaching Practice", each of the teachers was asked to select 10 items. These items were to reflect those practices that the teachers believed they currently were most adept at implementing. In addition, the teachers were asked to briefly provide examples from their actual practices of how they implement these 10 identified practices. The review sheets were then analyzed using a content analysis process (as described above) to assess the teachers' perceptions of their own skills and beliefs about the implementation of UDL practices.

Worksheet for your objectives. During the planning meeting, the teachers and

researchers reviewed the teachers' selected targets for improvement and developed a plan for achieving competence on the target practices. Each plan included an objective for each targeted objective such that achieving competence was jointly defined and could be measured. Again, using a content analysis process the completed worksheets were reviewed to provide insight into understanding the process and results of the planning meeting.

Consultation meeting minutes. Consultation meeting minutes were recorded and disseminated by email to the meeting members. These minutes described the issues discussed such as suggestions from the investigator and concerns from the teachers, decisions made for the next steps, and evaluation of progress towards meeting the target objectives through use of the GAS scales. Content analysis was conducted to provide insights into the impact of the consultation process and for identifying barriers and facilitators encountered by the teachers as they work toward achieving their targets for improvement.

GAS scale monitored by teachers and researchers. Throughout the intervention phase, the teachers were asked to monitor their own progress towards their objectives by utilizing a jointly designed GAS scale. Teachers' self-monitored GAS (i.e., teacher rated their own progress) was compared with the investigators rating of the teacher's progress on the GAS. The investigator ratings were based upon their viewing of the math class videotapes as noted below. For each session, a final GAS score was determined by consensus between the teacher and investigator following their discussion of how and why they had scored as they did. Although GAS is often used to document student progress, it can provide an individualized, criterion-referenced approach to describing the teachers' instructional changes and thus can be a very useful tool for supporting self-monitoring by teachers. All GAS scores were graphed and

visual inspection was used to assess change in teacher behavior over time.

Teachers' implementation record. Along with the self-monitoring using the GAS, teachers was asked to keep a record for each of their mathematics class regarding their perception of the implementation process and its impact on their math class. Content analysis was conducted to illuminate the issues raised by teachers in these teacher logs.

Videotaped mathematics classes. Participant teachers were videotaped as they taught their mathematics classes 3 times during the baseline phase, and weekly (i.e. 8 times) during the intervention phase. The teachers' teaching practices in these videotapes were analyzed from the perspective of GAS scales developed at the planning meeting. That is, the videotapes were used to score the teacher's on the GAS to assess their progress towards advanced levels of implementation of the UDL principles. The investigator and the second NISE researcher viewed the videotape together and discussed the teachers' progress, students' changes, and noted the strengths and needs for improvement in the teaching provided. Based on the discussion, the investigators rated the teachers' progress on the GAS scales, and developed plans for the items to discuss with the teacher during the next consultation visit. For data collection purposes the videotapes were only used to rate the GAS from the investigator's perspective (see above on use and analysis of GAS data). No further data analysis was conducted with the videotapes.

Student outcome measure. In order to begin to understand the potential impact of the implementation of UDL principles on student outcomes for both students with special needs and general education students, four data collection and analysis activities were conducted: 1) standardized pre and post achievements test data; 2) standardized pre and post assessment of socialization and motivation; 3) videotape observation of student classroom behavior pre and

post intervention; and 4) collection and analysis of student academic products.

The standardized pre and post achievement test data and assessment of socialization and motivation were obtained by gaining access to the results of a series of assessments administered to all students in the participant school: (a) standardized academic achievement test in mathematics which is designed to test the students' knowledge of the content from the previous or current grades and (b) Q-U Assessment (Kawamura, 2002) for assessing the level of socialization and motivation for each student in a classroom, which is a standardized psychological assessment in Japan. These measures had been completed prior to the intervention phase and then conducted at the end of the intervention phase. These data provided an initial assessment of the impact of the UDL on student academic achievement, and psychological aspects such as socialization and motivation. In addition, a school administered behavioral checklist completed by the classroom teachers was used during the initial phases of consultation to assist in understanding the students and the classroom context but not to assess student outcomes.

Videotape observation of student classroom behavior pre and post intervention was used to develop the third student outcome indicator. That is, based on viewing two videotaped math sessions, one from before implementation and one during implementation, observational reports were developed describing the student participation during the math lesson. The two resulting observational reports, before and during implementation of UDL, were compared to analyze the changes in students' participation in the class in terms of their engagement in tasks, the content and quality of their utterances, the frequency of their spontaneous initiations of interactions with the teachers, and other relevant student behaviors that were noted during the viewing.

The final indicator of impact on student behavior was an analysis of changes noted in the quality of students' academic products, such as worksheets and short tests or quizzes. These academic products were collected both prior to and during the implementation. Products were coded in terms of their accuracy (i.e., scores based on correct and incorrect responses) and quality (i.e., level of complexity of their responses) as well as factoring in the complexity and difficulty level of the response expectations in the products themselves. The coded products were summarized at two points in time (before and during implementation of UDL) and the results were compared to note impact on students' math skills.

Ensuring Trustworthiness

Maxwell (2005) discusses that validity in qualitative research is not the result of indifference, but of integrity. In order to increase the credibility of the data analysis, several strategies were used from the validity test by Maxwell (2005). These strategies are intensive involvement, rich data, respondent validation, triangulation, and comparison. First, intensive involvement of the investigator was established throughout the study, which provided for opportunities for multiple perspectives and more direct data from the participants (Maxwell, 2005). Second, "rich" data was obtained as a result of the intensive involvement. Third, through respondent validation, feedback on the data analysis was continuously solicited from the participants. This process is an important method for ruling out the possibility of misinterpreting the participants' worldviews (Maxwell, 2005). Fourth, in order to establish triangulation, information was collected from a variety of diverse sources of data (e.g., interview data, written records of discussions with teachers during the interventions, written products). Fifth, the case study research approach provided the opportunity for some initial analysis of comparison across

participants and context in terms of similarities and differences that have the potential to deepen our understanding of the critical elements of implementation feasibility and sustainability.

Furthermore, this strategy lays the foundation for some preliminary analysis of causality (i.e., child level of skill attainment on satisfaction of teacher). In addition to Maxwell's validity test, by peer examination, analysis and findings were shared with another researcher as they emerged and logical consistency between the themes and the analysis were thus examined.

CHAPTER 4

Results

The purpose of this research is to examine the process and experience of Japanese early elementary general education teachers as they are trained through a consultative approach to implement the curricular innovation of Universal Design for Learning (UDL) within their math lessons. In addition, the impact of implementing UDL principles on student outcomes is examined. The process is described in three cases. The first case, a third grade in S School will be presented, followed by the second case, first grade at S school. Lastly, the third case, third grade H school, will be presented.

Case 1: Third Grade Classroom in S School

The setting of Case 1 was a third grade class at S school. A two-month (i.e., late October to the middle of December) period of consultation for this class was conducted. A full description of the work with Case 1 is provided using the following sections: characteristics of the teachers and students, the intervention phase, and the follow-up phase.

Characteristics of Teachers and Students

Two teachers were assigned to provide instruction for the math class. One of the teachers was designated as the primary or lead teacher for the math sessions but was actually a support (non-homeroom) teacher. The homeroom teacher for the math session served as an assistant teacher. The lead teacher was a female and the assistant teacher was a male. Both teachers' were in their late 40's and have more than 20 years of teaching experience in elementary schools. Although neither teacher had special education certification, the lead teacher had teaching experience in a special education classroom.

The teachers reported that of the 31 students in the class, there was one student with identified special needs and eight students with some learning difficulties or behavioral issues. Some of the concerns noted by the teachers' concerns for these 9 students were as follows: "having difficulty in remembering and utilizing knowledge", "often playing with their fingers during the class", "having sluggish movements", and "unmotivated". When the teachers were asked what kinds of support they were providing to these students, their answer was, "We provide them individual instruction at their worksheet time".

One math class session observation, during which extensive field notes were collected, was conducted as a baseline measure. The primary instructional model used by the two teachers was a traditional Japanese instructional style, which emphasized whole group lecture and seatwork. To begin the class session, the lead teacher explained a new concept to the whole group by using the textbook. The lead teacher asked some questions about the material covered, and required the students to answer the questions one after the other following the order in which they were seated. On occasion one or another boy in the class would call out a response that was unrelated to the question asked. The teacher would call them down by name and reprimand them for disrupting. After the whole group lecture and review, the teachers distributed worksheets and the students were expected to complete them independently. While students were working, the lead-teacher and the assistant-teacher went around to students' desks, and provided individual instructions to any students with questions or difficulties in solving the problems. When students were not working on their worksheets or off task, the teachers called them by name and instructed them to complete their work. Near the end of the class session, the lead-teacher asked the students to return their attention to her. Again following the seating order, the teacher asked

each student to provide their solution or answer to one of the problems on the worksheet. The lead-teacher indicated if the answer was correct or incorrect providing the correct response if needed. The students were to check their worksheet as the answers were provided. At the end of the class, the checked worksheets were collected for the teachers' review.

Intervention Phase

The intervention phase of the work with the Case 1 teachers and students is presented in the following sections: the planning process, changes in teachers' performance, changes in teachers' perception, and changes in students' performance.

Planning process. The intervention planning process as implemented with Case 1 is below. The process is explained across four specific components: teachers' teaching practice self-assessment checklist, planning meeting, establishing goals for the teachers, and consultation plan.

Teachers' teaching practice self-assessment checklist. Table 1 provides a copy of the lead teacher's pre-intervention phase completed "self-assessment checklist for teaching practice" form. In reviewing, the first column, "we practice this", the teacher reported that of the 30 items listed she had implemented 27 of them. Furthermore, of the 27 implemented, she felt that only 6 were not particularly successful. In the third column, the teacher is asked to note the level of need (i.e., low level of need, middle level, or high level) for the teaching practice. Here the lead teacher indicated that all but 2 of the items were "high need". There was only one item that she considered as "high level of need" which she also noted as not practiced (i.e., Level of attainment is clear for individual students with diverse objectives).

Planning meeting. A planning meeting was held with the participant teachers, the

school principal, and the investigators. The teachers explained that some students in the class had behavioral issues, and when they had nothing to do, they often became disruptive and acted out. The lead-teacher said that she was trying to find a way to get the students interested in what she was teaching. She indicated that she was trying to come up with a strategy for making the learning materials more interesting and engaging for the students in order to keep them engaged. The assistant-teacher acknowledged her efforts and the lead-teacher, in turn, thanked the assistant-teacher, since he was very helpful in managing students' challenging behaviors.

Establishing goals for teachers. Initially, the lead-teacher suggested that the consultation should be focused on two items on the checklist that she felt that she did not routinely do or did not do well. These were: "Teachers set objectives according to the learning needs of diverse students" and "Level of attainment is clear for individual students with diverse objectives". On the other hand, the school principal had a different opinion. She suggested that it might be better for the lead-teacher and the assistant-teacher to focus on what they were practicing but could use some improvements (i.e., "devising learning materials" and "staff collaboration"). After further discussion, the teachers, the school principal, and the investigators agreed upon two goals. The goals selected were: 1) teachers devise teaching materials to help all students' understanding, and 2) teachers collaborate in providing appropriate supports for all students. The team then developed a five level goal attainment scaling (GAS) to monitor the teachers' changes in teaching. The GAS steps for the first goals were as follows: 1) Explain learning contents using only verbal explanations, 2) Explain the learning contents using the same instructional material for all of the students in the class, 3) Use the same instructional material for the whole class but provide additional instructional supports for students with learning

difficulties, 4) Develop a modified instructional material for students with learning difficulties, and 5) Develop additional instructional materials for students with learning difficulties and for advanced students.

The GAS steps for the second goals were as follows: 1) Teachers do not work together to establish role-sharing, 2) Teachers together define role-sharing and work together cooperatively, 3) Teachers develop and implement some individualized instructional supports cooperatively to address the needs of students with learning difficulties, 4) Teachers work together collaboratively to provide appropriate supports for students with learning difficulties, and 5) Teachers work together collaboratively to provide appropriate supports for all, including advanced students.

Consultation plan. A consultation plan was developed based upon information gathered during the class observation, the teacher completed “self-assessment checklist”, and the discussion during the planning meeting between the teachers and the investigators. The lead-teacher appeared to be somewhat nervous as she taught the class and lacked confidence in her ability to manage the students’ behaviors. On the other hand, the assistant-teacher, as the homeroom teacher, seemed to have developed a trust relationship with the students. The lead-teacher was observed to rely heavily on the assistant-teacher in order to build a relationship with the students. Nevertheless, it was notable that the lead teacher’s self-evaluation of her teaching practice was much more positive than what the investigators actually observed in her teaching. However, the school principal had expressed some concern with the lead-teacher’s confidence in her ability to effectively instruct the students and felt the teacher was not a good judge of her own skills.

The investigator decided that the lead teacher would benefit from clear and concrete feedback on good teaching practice in order to build her confidence and to allow her to further develop her teaching skills and sense of self-efficacy. Specifically, to address the goal for developing instructional materials, the investigators would encourage the lead teacher to utilize skills in which she had already demonstrated competence, and then to learn to individualize teaching materials to appropriately address the special needs of her students. For the goal on enhancing the collaboration between the two teachers, the investigators would ask the assistant-teacher to take charge of the behavioral management for the students exhibiting the most challenge in terms of on-task and engaged behaviors, and encourage the lead-teacher to focus on leading the whole class instruction.

Changes in teachers' performance. As noted earlier, Goal Attainment Scaling (GAS) was used for monitoring the teachers' teaching practices during baseline, intervention, and follow-up phases and are displayed in Tables 2 (Goal 1) and 3 (Goal 2). The analysis of qualitative data (i.e., consultation meeting minutes, discussion of the GAS scales, math-class observation field notes) reveals that during the intervention phase, the changes in teaching practice could be divided into the following three time-based phase change themes: 1) Sprint from the start phase, 2) I'm nearly out of balance phase, and 3) Do it in my own way phase. In addition, within each of these phases, the changes noted could be organized into three broad instructional strategy themes: a) lesson structure and time allocation, b) developing instructional teaching materials, and c) teachers' collaboration.

Sprint from the start - Session 1. The first time-based phase change-theme included the time period just after the planning meeting as the teachers struggled to apply the suggestions that

came out in the planning process. Both teachers seemed to feel positive about their change in their teaching style.

Lesson structure and time allocation. At the beginning of the class session, the lead-teacher reviewed the content addressed in the previous class session and reviewed with the students any problems that the students had shown difficulty in solving. At times the lead-teacher seemed nervous and spent too much of her instructional time trying to address students that were off-task and causing class disruptions. However, in general, the students appeared to be interested in the new instructional materials and the lesson was more interactive and engaging.

Developing instructional materials. Teachers worked to develop instructional materials that would engage their students and maintain their attention. For example, the assistant-teacher used a PowerPoint presentation to illustrate a new concept and support students' understanding through visual representation as well as auditory. The lead-teacher used a picture of a cartoon character and acted out a play in explaining some of the strategies she was presenting to solve problems. The majority of the students maintained active engagement as they viewed these visually attractive teaching materials. Another strategy implemented by the teachers was the development of two levels of worksheet. That is, the teachers prepared two levels of worksheets one for the general curriculum content and one on a basic level. The students were then allowed to choose one, which the students seemed to enjoy.

Teachers' collaboration. At the end of the class session, the lead-teacher asked the students to hand in their notebook in which they had placed their completed worksheet so that she could individually review them and assess each student's level of understanding. The lead teacher consulted with the assistant teacher about the students who were struggling, or

exchanged memos with the assistant-teacher about the upcoming math unit. The lead-teacher commented to the investigator that she felt very good about the collaborative work with the assistant-teacher. Specifically, she said,

I am consciously having more communication with the assistant-teacher. Since he is the classroom teacher, he knows what is going on in the classroom. He gave me information on individual students that I don't know. I hope that we can continue to do interesting collaborations on our lessons planning.

Basically, the lead teacher was in charge of leading class, and the assistant teacher's role was supporting individual students in need. When the assistant-teacher used teaching materials on the computer for the whole class, the assistant teacher would lead the class and the lead teacher would take on the role of supporting the individual needs of students.

I'm nearly out of balance - Sessions 2 through 4. During the second time-based phase theme, the lead-teacher continue to try to apply the feedback from the investigators into her math class. However, the preparation for school events, a school festival and a fieldtrip, made the teachers extremely busy. She often spoke to the investigator that she was frustrated, because she wanted to do many things to improve her math class, but there was no time to prepare for it.

Lesson structure and time allocation. Although the lead-teacher continued to try reviewing with the students the key content from the previous class to maximize their understanding, she sometimes spent too much time in review and lost the lesson. During the ongoing consultation, lesson structure and effective time allocation during the whole group lesson was often a topic of discussion.

Developing instructional materials. The lead teacher took the feedback from the

investigators more seriously and tried to apply their suggestions even though she didn't understanding fully the meaning of the suggestion. For example, the investigator proposed the use of tips cards for the students who were having difficulties in remembering all of the strategies to solve the math problems. Although the lead-teacher prepared tips cards, she didn't understand why, how, or when the students needed them. She used the tips card not for the students struggling to learn the content during the individual work time, but used them at the beginning of the class as she conducted the whole group instruction, and as a result, failed to utilize them effectively. After this math lesson, the lead-teacher commented to the investigators:

When you give me advice, you always convince me of the need for support for the students who have difficulties in learning. However, when I take your proposal seriously, I feel like I'm almost losing my own pace, my own style, and I become nearly out of balance.

During this phase, the lead-teacher seemed to lack available resources in terms of mental, emotional, and time to develop a new way of doing things.

Teachers' collaboration. The teachers became busy preparing for and helping with school events and thus were only having short meetings just before the math class sessions. The assistant-teacher continued to use the PowerPoint instructional materials, but the lead-teacher didn't seem to know when and how he would introduce the computer during the lesson and when they would exchange roles.

Do it in my own way - Sessions 5 through 7. During this time-base theme phase, the lead teacher and the assistant teacher developed many instructional materials according to the students' individual needs. The lead teacher appeared to be cheerful and showed confidence in communicating with the students. She commented, "All I can do is to do it in my own way!"

Lesson structure and time allocation. The lead teacher routinely paid close attention to the time allocations; order and pacing of the lessons; including ensuring a review of the previous lesson; introduction on the content; expansion; and generalization. The lesson structure of the large group and individual activities became better organized and time was efficiently used to address all aspects of the content.

Developing instructional materials. The teachers developed a variety of supplemental teaching materials and introduced them for use in the classroom to support the students individual learning needs. For example, they developed assembling paper tiles for counting to 10, 100, and 1000; simplified multiplication tables; and tools for unit conversion. In addition, opportunities for active learning for the students, such as learning through manipulation and learning with a paired friend increased. There was a notable change in the level of the students' active and engaged participation in the math lessons. Students seldom spoke out of turn and disrupted the large group math lesson of the lead teacher.

Teachers' collaboration. Appropriate allocation of responsibilities and clarified roles between the lead-teacher and the assistant teacher were established. While the lead teacher led the whole group, the assistant teacher provided support to individual students to enhance their learning. When the assistant teacher supported the students with learning difficulties, he used supplemental teaching materials, such as tips card and simplified multiplication tables, effectively. After the class, the lead teacher and the assistant-teacher shared information about the students' response to the lesson content and which supplemental teaching materials were effective for whom.

Follow-up Phase

Approximately one month following the end of the intervention phase, two math lesson sessions was observed. When the investigators came to observe the math class in January, the lead teacher seemed bewildered and asked the investigator, *“Am I supposed to continue the lesson that way you suggested? I thought that your observations were finished last month.”*

The participant teachers in Case 1 did not maintain their improved teaching practice post intervention. The lead teacher’s teaching style returned to what it had been during the pre-intervention or baseline period.

Changes in teacher’s perception. In order to understand the changes that occurred in the teachers’ perception as a function of the intervention, two sources of data were analyzed: a) changes in the “Self-Assessment Checklist for Teaching Practice” completed by the lead teacher pre- and post-intervention and b) the teachers’ reflections presented during the post interview.

Changes in Self-Assessment of Teaching Practice Checklist. The lead teacher’s completion of the Self-Assessment Checklist pre and post intervention showed some positive changes in the lead teacher’s perception of her teaching practices. For example, at post-intervention she assessed herself as “practicing well” on all the 7 items in “Foundation for the Class”, including the 2 items that she had checked that she hadn’t done well at pre-intervention (i.e., “Teachers ask thoughtful questions that students would be interested in” and “Teachers have ingenuity in writing on blackboard”). In addition, she scored herself as practicing successfully on the item that was targeted as her goal (i.e., Teachers provide learning materials to understand key concept/skills). It seemed that the lead-teacher was confident in her understanding and ability to practice the teaching practice discussed and presented during the intervention phase.

On the other hand, she noted that she implemented the practices in the items “Teachers provide appropriate learning materials for individual needs” and “Teachers provide appropriate level of instructional support to individuals”, but it was unsuccessful, which is the same way she scored the items at the pre-intervention. She also checked that she didn’t implement the teaching practice item, “Teachers set objectives according to the learning needs of diverse students”, which she had noted that she practiced at the pre-intervention phase, although not successfully. It seemed that the lead teacher’s self-evaluation scoring lowered on those items, which she felt that she was not able to implement well during the intervention phase, or those practices she didn’t fully understand.

Teacher’s reflection. After the intervention, the lead teacher looked back on her teaching practices and expressed what she felt that she had learned through the consultation.

The consultation made me think of what I had never thought of... I realized that up to that time, I had given lessons without really thinking it through.

On the other hand, she expressed that she felt pressure from the weekly observations and the video recording. Her comments below shed light on the teacher’s thinking as she moves between the “nearly out of balance” phase to “do it in my own way” phase.

You gave me suggestions during the consultation, but they sometimes confused me. I made a decision at one point out of necessity and decided to do it my own way.

Fortunately, my way worked well. I just felt that I could not accomplish what was beyond my ability.

The assistant teacher commented on the positive effect of the intervention on their teaching skills, and felt that creating defined steps to achieving the goal was very useful.

We, the teachers, became set on our own goals and kept our steps to achieving our goals always in mind. I think this situation made us plan and implement easy-to-understand lessons for our students. The students told me that they came to feel easy and comfortable in understanding the math.

Changes in student performance. In order to understand the changes that may have impacted the students' performance as a function of the intervention, two sources of data were analyzed: a) pre- and post-intervention scores on Q-U Assessment (Kawamura, 2002) for assessing the level of socialization and motivation for each student in a classroom, which is a standardized psychological assessment developed and used in Japan; and b) Videotape observation of students' classroom behavior pre- and post-intervention.

Q-U assessment. The Questionnaire of Q-U assessment is usually implemented at the beginning and at the end of the school year in Japan. Thus for the Case 1 Class, the pre-assessment occurred approximately 5 months before intervention began and the post-assessment was completed two months post-intervention. Given that the timing does not directly line up with pre- and post-intervention points of Case 1, the results are seen as an indirect reference of the effects of the intervention.

The Questionnaire of Q-U assessment consists of two sub-scales. One sub-scale addresses satisfaction with classroom life, and the other motivation for school life. Table 4 displays the results of "satisfaction of the classroom life" scale. Each student in the class would belong to one of the 4 groups. According to Kawamura (2002), students in "satisfied with classroom life" group likely have good relationships with his/her classmates, and show high levels of motivation for learning. Students in "not fully accepted by their classmates" group may

not have any specific complaints but may not enjoy their school lives. They may be inconspicuous in their classrooms. Students in “receiving invasive behavior ” group may have trouble with forming positive relationships with their classmates. He/she may have strong victim mentality, or egocentric feeling. For the second and third groups, it is recommended that additional supports be provided by teachers to facilitate their becoming well adjusted members of the class. The fourth and final group, those “dissatisfied with classroom life”, should be provided with the most intense and extensive support. These students may experience bullying from their classmates and may show little motivation to learn, which worsen across time.

The Case 1 – the Third Grade Class, at pre-intervention, had 52% of the students in the “satisfaction of classroom life” group, which was higher than the national average of 41%. However, at the end of the school year, the percentage declined to 37%, which was lower than the national average. In response to this change, the percentage of the students who are in the “dissatisfaction of the classroom life” group increased from 16% to 27% by the end of the school year. The result illustrates that in the Case 1 Class, more students came to feel less comfortable in their classroom at the end of the school year. The second Q-U assessment was completed more than two months after finishing the intervention. The teachers of Case 1 didn’t maintain the impact of the intervention, which might have affected the result of the second Q-U assessment.

As to the Student T who was selected by the teachers as a student experiencing learning and behavioral difficulties, he stayed in the group of “satisfaction of classroom life” at both first and the second assessment.

Videotape observation of student classroom behavior. During the baseline observation, it was noted that there were 2 or 3 students who frequently spoke out in the class and caused

disruptions when the lead teacher was explaining or giving instructions in the whole group portion of the lesson. One of the students was Student T, who had been selected by the teacher as a student experiencing learning and behavioral difficulties. At the individual work time, Student T was off-task and not engaged in completing the worksheet but playing with his pencils and calling out to the teachers occasionally to obtain their attention.

In one lesson near the end of the intervention period, there were no verbal disruptions by any of the students during the large group lessons and most of the students seemed to be actively engaged in the learning activity. Sometimes the students initiated asking questions to the teachers or talked with their friends about the activity, which could have created the impression of “active” and “lively”. Student T engaged in the worksheet eagerly and with much enthusiasm. Occasionally, he called out “I’ve done it!” or “All right! It’s correct! ”, expressing his joy about his developing understanding and learning.

At the follow-up point, the lead teacher’s teaching style was back to the same style seen at base-line period. Following the teacher’s return to her former teaching approach, the students, including Student T, were working in silence. There were very few initiation of interaction to the teachers from the students (e.g. asking questions, commenting to the teacher), which created impression of “lifeless” and “boring”.

According to the interview with the teachers after the intervention period, both teachers noticed that Student T, who had been speaking out in a disruptive manner at baseline, became actively engaged in the learning activities, and started to communicate with teachers and friends in a proper manner during the intervention period. The teachers felt that it was the fruits of their changes in teaching method that helped Student T and other students become interested in what

they were teaching, and helped the students understand the content more easily.

Case 2: First Grade Classroom in S School

The setting of Case 2 was a first grade classroom at S school. A two-month (i.e., January and February) period of consultation for this class was conducted. A full description of the work with Case 2, as noted earlier, is provided using the following sections: characteristics of teachers and students, the intervention phase, and the follow-up phase.

Characteristics of Teachers and Students

Two teachers were assigned to provide instruction for the math class. One of the teachers was designated as the primary or lead teacher for the math session but was actually a support (non-homeroom) teacher. The homeroom teacher, for the math session served as an assistant teacher. Both teachers were female. The lead teacher was in her early 30's, had both specialized certification and previous experience teaching students with special needs. The assistant teacher, who was in her early 40's, had neither certification nor experience in teaching students with special needs. While there were 27 students in the math class, the teachers reported that much of their attention was regularly directed to the same 12 students. The twelve students included all 7 students who had been identified as struggling learners. Some of the concerns noted by the teachers for these 12 students were as follows: "having difficulty in listening to the teacher in large group", "not understanding the notion of right and left", "lacked confidence in their ability to answer the teacher questions and generally being unable to learn and master the content", "having difficulty in concentrating", and "having sluggish movements". When the teachers were asked what kinds of supports they were providing to these students, their answer was "providing individual instruction during the independent work time when students were

completing worksheets” and “providing individual instruction after school”.

Two math class session observations, during which extensive field notes were collected, were conducted during the baseline period. The primary instructional model used by the two teachers was a traditional Japanese instructional style, which emphasized whole group lecture. Both teachers, however, were seen to be embedding significant amounts of additional instructional supports and scaffolding as a part of their instruction to the whole class in response to the fact that nearly half of students were struggling. For example, they clearly articulated specific rules on students’ speaking, question asking, and listening expectations during the whole class lessons. They provided direct instruction on the organization of learning materials and context including use of the textbooks, paper, and pencils on each student’s desks. The teachers also prepared manipulatives to provide concrete hands on illustrations of the learning content. During the math lessons, the lead teacher and the assistant teacher often checked if each student was following teachers’ instructions appropriately, and that all the students were engaged and working through the learning activity as instructed by the lead teacher.

Intervention Phase

The intervention phase of the work with the Case 2 teachers and students is presented in the following sections: the planning process, changes in teachers’ performance, changes in teachers’ perception, and changes in students’ performance.

Planning process. The intervention planning process as implemented with Case 2 is presented below. Specifically, the process is explained across four specific components: teachers’ teaching practice self-assessment checklist, planning meeting, establishing goals for the teachers, and consultation plan.

Teachers' teaching practice self-assessment checklist. Table 5 provides a copy of the lead teacher's pre-intervention phase completed *Self-checklist for Teaching Practice*. In reviewing the first column, "we practice this", the teacher reported that 11 of the 30 items listed for the seven categories were not used. Two of these 11 items were in the area of *Foundations for the Class*, one in *Setting Objectives*, one in *Instructional Delivery*, three in *Materials*", one in "Student Participation", and three in "Assessment." Moving to the third column, the teacher notes the level of need (i.e., low level of need, middle level, or high level) for the "teaching practice". Again of the 11 items noted as not used, the teacher rated 3 of the items as low need in terms of needing training, 3 as medium need, and nearly half (i.e., 5 of 11) as high need. Those that the teacher indicated as "high need" for needing to learn included: teachers ask thoughtful questions that students would be interested in, teachers have ingenuity in writing on blackboard, teachers provide appropriate learning materials for individual needs, teachers provide students with choice opportunities, and level of attainment is clear for individual students with diverse objectives.

Planning meeting. A planning meeting was held with the participant teachers, the school principal and the investigators. The teachers expressed concern that because of their focus on the 12 students with learning difficulties the pacing of their lessons was considerably slower than the recommended pace for the national curriculum. The teachers were also concerned about not appropriately meeting the needs of the students who learned the concepts more quickly and had to wait for other students before moving forward. Both teachers let the group know that they were hopeful that the project would help them learn strategies for teaching both groups of students to insure that all children were having their individual needs met and were learning.

Establishing goal for the teachers. During the planning meeting, the teachers together with the investigators targeted one goal for the teachers. The goal selected was: the teaching materials and instructional materials are developed to address a variety of proficiency and content levels and students are provided a choice and make use of the choice to select appropriate learning materials. The team then developed a five-level goal attainment scaling (GAS) to monitor the teachers' change in teaching. The GAS steps were as follows: 1) use one material and one strategy for whole class, but is not effective for the majority of the students, 2) use one material and one strategy for whole class and is somewhat effective for the majority of the students, 3) materials are prepared to address the different proficiency levels of the students according to individual needs, 4) materials and strategies are prepared to address the different proficiency levels of the student and provide students with choice for supporting their own learning, 5) students appropriately choose materials and strategies that appropriately match their individual strengths, strategies and needs. The GAS was then used to support the teachers in self-monitoring their "learning" and achievement of the target goal.

Consultation plan. A consultation plan was developed based upon information gathered during the class observation, the teacher completed the self-assessment checklist, and the discussion during the planning meeting between the teachers and the investigators. Even though the teachers were observed to provide supportive instruction to the students in an attempt to address the range of learning strengths and needs present in their classroom, they only made use of one teaching material and strategy. Thus, it was clear that there was room for improvement including the provision of multiple supportive teaching materials and strategies aligned to individual student learning needs. Another new instructional skill to be introduced for the

teachers was that of providing students with choice-making opportunities, which the lead teacher considered as “high level of need”, but didn’t use in instruction. While the changes were relatively straight forward, teacher found these challenging, because they needed to change their lesson style and their way of thinking about the teaching process.

The school principal’s considered the lead teacher to be a highly skilled teacher and noted that she set high expectations for her teaching and for the learning of her students. This tendency was also noted in comparing the teacher’s self-checklist and the investigator’s observation. That is, while the teacher marked her teaching as effectiveness as relatively low the investigator did see a number of the skills being implemented. An important component of the consultation plan was to point out to the teacher instances of implementation of quality teaching practices and assist her in reflecting on the positive impacts these practices were having on the learning of her students. In addition, the consultation plan included the provision of specific feedback and information to the teachers on planning, implementation, and evaluation of the teaching strategies targeted for intervention. Finally, since it was clear that the teachers’ teaching beliefs were grounded in a collectivism view, characteristic of Japanese culture, they would need support in how to incorporate the principles of UDL into this important held belief.

Changes in Teachers’ Performance. As noted earlier, Goal Attainment Scaling (GAS) was used for monitoring the teachers’ teaching practices during baseline, intervention, and follow-up phases and is displayed in Table 6. The analysis of the qualitative data (i.e., consultation meeting minutes, discussion of the GAS scales, math-class observation field notes) reveals that during the intervention phase, the changes in teaching practice could be divided into the following three time-based phase change themes: 1) a Sprint from the Start, 2) provision of

Multiple Materials Established with Provision of Multiple Strategies Sought, and 3) provision of Multiple Strategies Established. In addition, within each of these phases the changes noted could be organized into three broad instructional strategy themes: a.) providing multiple teaching materials and strategies, b.) choice-making by students, and c.) learning with friends. The presentation of the results for Case 2 will be organized using the time-based phase change themes and the instructional strategies themes.

Sprint from the start –Session 1. The first time-based phase change theme included the time period just after the planning meeting as the teachers were trying to apply the suggestions that emerged from the discussions with the investigators. After the planning meeting when the instructional change goal had been established (i.e., The goal selected was: the teaching materials and instructional materials are developed to address a variety of proficiency and content levels and students are provided a choice and make use of the choice to select appropriate learning materials) the teachers together with consultation from the investigators moved forward quickly to work to address the various aspects of the goal.

Providing multiple teaching materials and strategies. As noted earlier, during the baseline observation the teachers were noted as only using one instructional strategy for all of the students. At the beginning of the intervention period, the investigators suggested that the teachers develop supplementary instructional materials and plan for the use of additional instructional strategies to address the learning needs of the students who were struggling to learn the content. The learning objective of the first lesson of the intervention phase was for students to be able to group items into sets of 10 in order to count objects up to 100. In order for students to practice the grouping and counting skills, the teachers prepared 3 different worksheets, which had

different difficulty level. The teachers had the student choice which worksheet they would complete (see section on choicemaking by students below). In addition, for the students who had difficulty in successfully completing the grouping and counting worksheets the teachers prepared marbles and sticks and worked individually with students to practice the grouping and counting with these concrete objects during the designated skill building time.

Choice- making by students. The teacher's first use of choice making opportunities for the students was during the intervention phase, since none had been provided during the baseline. As noted above, the teachers prepared three types of worksheet each representing a different difficulty level related to the grouping and counting task. On all three worksheets, multiple mice faces were printed, and students were asked to count how many mice were on the worksheet by circling groups of 10. In the easiest worksheet, the mice faces were printed side-by-side in rows making it relatively easy to circle every 10 mice. The most difficult worksheet had the mice faces printed randomly, such that it was more difficult to created groups of 10.

The lead teacher's stated reason for preparing the worksheets at 3 levels of difficulty;
In our previous lessons, some students had difficulty in circling the drawings in order to make groups of 10, because they had some problem in discriminating the graphic figures. The objective of this lesson is not discrimination of the graphic figures, but rather grouping by 10. So we prepared the worksheet so that even those students with difficulty in graphic discrimination could learn the concept of grouping by 10s.

The teachers were, however, very surprised to find that the target students who had difficulty in graphic discrimination chose the easiest worksheet. The lead teacher commented as follows.

The students who had difficulty in circling the items in their textbook previously appeared

to know on their own which worksheet would give them less problems. They seemed to choose the worksheet based on their previous experience and we were clearly relieved to see them available. We had doubted that they could make this choice on their own.

Although this was the teachers' first attempt at providing students with a choice making opportunity, they reported to be pleased with the outcome and a worthwhile strategy to use.

Learning with friends. At the beginning of the lesson, the teachers led a large group learning activity in which the students were asked to count off one after another in continuous fashion until they reached 100. The lead teacher timed the students' rote counting with a stopwatch. The time from an earlier lesson was posted on the blackboard so the students could compare their times and monitor their progress. When they reached 100, all the students looked at the teacher and were elated to hear that they had achieved a new lower time. It seemed that the team counting game was challenging but enjoyable for the students and all the students were making a concerted effort to achieve better times with each lesson. In the team counting game, there were some students who stumbled, and other students who provided verbal encouragement to the struggling student saying, "you can do it!" in a very natural, supportive manner.

The teacher who served as the assistant teacher for the math sessions, who is also the student's home room teacher, made the following commented.

It is not just certain students who make the mistakes, but actually every student may make mistakes at some point. Our students know it, and don't blame their friends who happened to make the mistake but rather try to support them.

It seemed that the classroom teachers had built strong, positive relationship among the students, which was reflected in their support of each other during the activities in the math lesson.

The teacher created an additional opportunity for the students to work together as friends and learn together. In this activity, students gathered together in groups of 4 and the teacher provided the group with a pile of small sticks and rubber bands. The students were then told to work together to bind the sticks together with rubber bands into bundles of 10 sticks. The teacher explained that this was their first attempt to use a small group instructional format since previously they had always used only a large group format.

Provision of multiple materials established with provision of multiple strategies sought –Sessions 2 through 6. The second time-based phase change theme started with the second math session and continued through the sixth session and represented the longest period for Case 2. It was during this time that the teachers came to feel comfortable in routinely developing and providing for student use a variety of teaching materials reflecting different difficulty levels as a part of each math lesson session. Simultaneously, however, they continued to seek more effective ways in which to provide supports and supplemental instructional strategies to enhance the learning of students who were experiencing difficulty.

Providing multiple teaching materials and strategies. The teachers, during the second time period, back very comfortable with preparing and routinely provided students with multiple worksheets with different level of difficulty. The teachers reported that they came to believe that providing students with worksheets with a variety of difficulty levels during the whole group instructional time as an effectively strategy for supporting students' learning.

In addition, the teachers wanted to find a way to provide supplemental teaching materials and instructional approached for those students who need appeared to need additional support to understand the content that had been presented during the whole class lecture and

activity. That is, while their whole class lecture and activities appeared to work for the majority of the students, there always remained some students who had difficulty in fully understanding the lesson content. It was during the individual work time that followed the whole group lesson that the teachers provided extra individual supports to the students who needed it. As a part of the consultation with the teachers, the investigators asked the teachers to find a way that students could choose appropriate strategies according to their own learning style, or students who needed to review previously learned materials and strategies could go back to them whenever they wanted. The teachers were open to the idea but wanted to think through how they could fit these approaches comfortably into the current organizational structure of their instructional approach.

Choice- making by students. During the individual work time, teachers were now routinely preparing multiple worksheets with different difficulty levels. In addition, the teachers were having the students choose which of the worksheets they considered to be an appropriate match for their learning. For example, for the math unit addressing the concept of “comparing number quantities”, the teachers prepared three types of worksheet, and students choose one of them. The least difficult one required the students to compare quantities of just two numbers, where as the next one had the students comparing 3 numbers and the most difficult required comparing a mix of two and three numbers. Teachers monitored their students as they were making choices providing encouragement and support as needed. The lead teacher expressed the following thoughts regarding the student’s worksheet choice making decisions.

There is no student who chooses the easiest worksheet because he wants to be lazy in his thinking. Student A chose the worksheet which has smaller number of questions because he set a goal for himself that he would not make any mistakes on his worksheet. Student B

chose a different worksheet, because he wanted to practice as many questions as possible.

The teachers were trying to understand the learning styles and preferences of individual students through careful observation of their student as they were selecting their worksheet. The teachers believed that the worksheet student controlled choice making system was working effectively for their students.

Learning with friends. An excellent example of the students learning together and supporting each other's learning is illustrated by the following scenario, Student I, who usually needed extra supports to master the content, was taking time quite a bit of time to write her answer to the math problem on the blackboard. All of her classmates were giving her encouraging looks and smiling warmly. When Student I completed the answer correctly, her classmates spontaneously clapped for her. Student I smiled and said, "Thank you very much". The teachers and investigators discussed how this clearly demonstrated that they had successfully implemented the class management strategy in which they focused the students on accepting individual differences and appreciating individual efforts.

During this phase of the intervention, the teacher could be seen routinely even during whole class learning activities going round to students' desks checking if individual students were following the teachers' directions and answering the questions correctly, and providing those who needed it with extra help and corrective feedback. Although this style worked well for many of students who were struggling to learn the content, some students who always learned the content quickly got tired of the long waiting time. The investigators suggested that when students had completed their work they could pair with their neighbor and check each others.

Provision of multiple strategies established - Sessions 7 & 8. The third time-based phase

change theme started with the seventh math session and continued through the eighth session. During these two sessions, the teachers fully embraced the practice of providing multiple supports and instructional strategies into their math lesson to address the range of abilities and learning needs of their students. With support from the investigators and through a reflective problem solving approach, the teachers developed a process for providing multiple instructional strategies within their math lessons to better address the range of learning needs of their students while still being able to maintain their preferred whole group instructional style. The teachers' commitment to implementing these new practices was possible because they believed that the new approaches were compatible with their firmly held teaching beliefs.

Providing multiple teaching materials and strategies. In the third phase, teachers continued to provide multiple worksheets with different difficulty levels and to require that the students choose which worksheet to complete. The teachers further developed and refined their implementation of this new instructional strategy and in particular looked to blending it more completely within their whole group instructional style. They found that they were most comfortable with continuing with beginning the lesson with whole class presentation and having all of the students engaged in the same learning activity. The teachers would then follow-up by checking for individual students understanding and provided individual support as needed. For example, in lesson 7 in which the learning objectives was problem solving to determine the ordinal number that comes before a number presented the following sequences of instruction occurred. The lead teacher presented a series of problems to the whole class. With each problem presentation the teacher provided the students with a strategy for solving the problem and then asked them to individually solve the problem and write down their answer. The problems and

strategies were presented one at a time and became increasingly more difficult to solve. That is, for the first problem the teacher suggested a strategy for finding the solution, which provided a lot of support and many clues for students. For the second problem, the teacher suggested a different strategy with fewer clues and supports. For the third question, the teacher suggested a more advanced strategy. The teacher allowed the students to use any strategy to solve problem. The students who needed supplemental supports used the first strategy for all practice problems and tended to, build their skills through repeated practice. On the other hand, the more advanced students were challenged to try the new, more complex strategies that teacher suggested and thus deepening their understanding of the content. This embedded individualization system was the fruit of teachers' efforts to improve their teaching so that they were better meeting the various learning needs of all of their students.

During the individual practice time, previously learned materials and problem solving strategies were also available for the students who were struggling to learn the content. It was observed that for the two students who had the most difficulty in double-digit calculation, the teacher asked them to take out manipulative tiles from their desks, and use them as supports for solving the problem. They also were observed to quietly mumble the rhyming words, a previously learned strategy, to solve the problem. The manipulative tiles and rhyming words were used by all of the students early on with most of the students no longer needing to use them.

Choice-making by students. During the 8th and final lesson the teachers planned a review session covering the 1st grade contents of the first grade using 7 different worksheets. The worksheet content included problems from the previous 3 learning units. The expected student behavior during the lesson was, "Study by choosing your own worksheet". The teacher began the

lesson with a brief review of the strategies to use for solving the various problems that they had learned in each learning unit. The teachers then provided a brief orientation to the worksheets, instructions for making appropriate selections of worksheets to complete, the process for self-grading of the worksheets, and how to know when to move to a new worksheet. Specifically, the lead teacher asked the students, “Which worksheet do you choose and why do you choose it?” Each student put his/her hands up, and answered to the question in his/her own words. The teacher also explained to the students the purpose behind the lesson by saying, “It is not the objective of this lesson to finish as many worksheets as possible. The goal, I’d like to see is that each of you can say ‘I learned more!’ and ‘I did my best!’ at the end of this lesson”. Following the orientation, the students worked enthusiastically through the worksheets. Some students selected to work on worksheets that covered content that they felt they were not particularly good at and wanted to learn to do better. Other students selected to complete more difficult tasks with some even moving to second grade contents, after completing all the worksheets. All students were encouraged to ask for support from the teachers if they had questions or felt they needed help. The teachers reflected on the lesson implementation stating:

It was first time for us to let the students work through the tasks at their own discretion for whole lesson time. We (teachers) had some anxiety because it had not been our style. However, we found that all of our students selected worksheets that really challenged them to improve their learning and worked on the self-selected worksheets with great enthusiasm. We saw clearly that every student wanted to spread his/her wings.

At the end of the class session, the students proudly exclaimed their feelings of accomplishment saying, “I’ve learned more!!” or “I did it!”

Learning with friends. During the seventh lesson, the learning unit addressed understanding ordinal number order. The teacher taught the concept using a game format. . She asked some of the students to make a line, and other students were given problems to solve regarding “ordinal number order”. Through actual maneuvering of their friends, the students were able to experience the concept of ordinal number in a concrete manner. All of the students were actively engaged in the game, appeared to enjoy the task, and worked together supporting each other in learning the concept.

Follow-up Phase

One month following the end of the intervention phase, a math lesson was observed. The lesson was titled “I am Dr. Calculation”, and the content was the review of a variety of calculation strategies that had been taught to the first graders and were a part of the national curriculum. The teacher presented the students with calculation problem options (e.g. addition to 9, subtraction to 9, addition over 10, and subtraction over 10) and asked each student to choose one group of problems. Then, in front of the whole class, each student responded to a series of calculation problems from the selected group presented by the teacher on flashcards. In another activity, the teacher asked each student to develop their own calculation problem and the present the problem and explain the solution to the class. Each student proudly presented their problem and was rewarded by a warm round of applause by the audience, their friends and classmates.

Changes in teachers’ perception. In order to understand the changes that occurred in teachers’ perception as a function of the intervention, two sources of data were analyzed: (a) changes in the “Self- Assessment Checklist for Teaching Practice” completed pre and post intervention by the lead teacher, and (b) the teachers’ reflections presented during the post

intervention interview.

Changes in Self-Assessment Checklist. Two clear changes on the lead teacher's completion of the "Self-Assessment Checklist for Teaching Practice" pre and post intervention were noted. First, post-intervention, the teacher reported that she practiced all of the items which she considered to be of "high level of need" when on the pre-intervention she had reported 5 high need items that were not being implemented. In addition, for each of the high need items, she now reported based on her on evaluation that they were being implemented well with high success. Second, the number of items which the teacher considered to be of "high level of need" had increased from 19 to 26 (i.e., 7 more items). Specifically the following items were added: 1. There are considerations for students' keeping good posture, 2. Teachers set objectives according to the learning needs of diverse students, 3. Teachers provide instructions in a variety of ways, 4. There are opportunities for hands-on activities for students, 5. Teachers plan peer-teaching or team-activities for all students' engagement, 6. Teachers provide worksheets for individual learning-time, and 7. Teachers assess students learning using multiple methods during class. Thus it appears that that while the lead teacher was observed to demonstrated new teaching practice, she also changed substantially in terms of her perception of what were important instructional strategies and her own ability to implement those important strategies.

Teachers' reflection. After the intervention, the lead teacher looked backed upon her teaching practices, and expressed what she felt that she had learned through the consultation.

Before the consultation, I was consciously thinking how I could make all the students understand the math content. However, I didn't have an understanding of concept of providing "choice making by the students" nor an understanding of how it could support

my teaching and student's learning, which I learned through this consultation.

The teachers also noted that they saw changes in their students during the intervention period. Both the lead teacher and assistant teacher mentioned that after the introduction of “making choice”, the students become more active and energetic in learning during the math class. In addition, the lead teacher commented that she now was more aware of some of the students’ abilities that she had not previously been aware of before. Specifically, she noted:

I realized that even first graders know their own capability and needs. When I asked the students, “Do you know why you had a wrong answer?”, they answered that “I was messing up on plus and minus.”, or “I got panicky.” Recently, student I and student N, who need relatively intensive supports, ask me, “I don’t understand this. May I use the manipulative tiles to count?”

The lead-teacher was very conscious of the changes in her teaching practices. Looking back on the consultation period, she commented:

Both we, the teachers, and the students had to realize that all the students didn’t have to do the same thing, and that in order to understand something and reach a target goal, the students may well take a variety of paths.

Changes in students’ performance. In order to understand the changes that may have impacted the students’ performance as a function of the intervention three sources of data were analyzed; (a) post- intervention scores on a standardized academic achievement test in mathematics which is designed to test the students’ knowledge of the content from the previous or current grades; (b) pre- and post-intervention scores on Q-U Assessment (Kawamura, 2002) for assessing the level of socialization and motivation for each student in a classroom, which is a

standardized psychological assessment developed and used in Japan; and, (c) review of students' academic products pre-intervention and throughout the intervention, such as worksheets and short tests or quizzes, and comments from the teachers on the products. One of the students who was struggling to learn the content (i.e., Student I) was selected by the teachers, and her pre- and post- student performance data is reviewed in greater detail to add to our understanding of the potential impact of the changes in the teachers' instructional strategies.

Standardized academic achievement test. The first grade level of the academic achievement test was conducted after the intervention, near the end of the school year. Since there was no academic achievement test available for the end of the kindergarten year, no test was conducted prior to the intervention. As presented on Table 7, all of the students except Students I, obtained an average score of 90 or better across the 3 sub-areas of mathematical thinking, processing quantities and figures, and knowledge of quantities and figures. Given the fact that 7 students had been identified as struggling learners at the enrollment screening, the likelihood that the teachers' teaching practice may have contributed to the high level of students' academic achievement in this class is plausible. For Student I, although the scores of "mathematical thinking" and "processing quantities and figures" were much lower than her classmates, she obtained relatively high score on "interest and motivation toward mathematics" and "knowledge about quantities and figures".

Q-U assessment. The *Questionnaire of Q-U* assessment consists of two sub-scales. One sub-scale addresses satisfaction with classroom life, and the other motivation for school life. Table 8 displays the results of "satisfaction of the classroom life" scale. Each student in the class would belong to one of the 4 groups. According to Kawamura (2002), students in "satisfied with

classroom life” group likely have good relationships with his/her classmates, and show high levels of motivation for learning. Students in “not fully accepted by their classmates” group may not have any specific complaints but may not enjoy their school lives. They may be inconspicuous in their classrooms. Students in “receiving invasive behavior” group may have trouble with forming positive relationships with their classmates. He/she may have strong victim mentality, or egocentric feeling. For the second and third groups, it is recommended that additional supports be provided by teachers to facilitate their becoming well adjusted members of the class. The fourth and final group, those “dissatisfied with classroom life” should be provided with the most intense and extensive support. These students may experience bullying from their classmates and may show little, motivation to learn, which worsen across time.

The Case 2 – First Grade Class, at pre-intervention, had 73% of the students in the “satisfaction of classroom life” group, which was higher than the national average of 41%. This illustrated that the, teacher and students in this class had already built a successful relationship, and that the majority of students were comfortable with their teacher and classmates. This tendency became even stronger post-intervention. Student I, however, scored such that she was also in the “satisfied with classroom life” group at the point of the pre-intervention assessment, but she changed to the “not fully accepted by classmates” group post-intervention.

Table 9 displays the results of second sub-scale, “motivation for school life”. The average initial scores of the Case 2 Class were above the national average and scores post-intervention increased across all areas of motivation including learning, atmosphere of the classroom, and relationships with friends. Student I’s scores this time also increased in the domains of motivation for learning and relationships with friends.

Academic products and teachers' comments. The teachers had bound all short tests and worksheets as in books for each student (i.e., "My Workbook") as a way of documenting and monitoring student progress. Reviewing Student I's "My Workbook" showed that she made clear and steady progress. Specifically, during the intervention phase Student I took the same short test addressing subtraction once at the beginning and again at the end of intervention. At the beginning of the intervention, she had 48 out of 62 correct (77%), and post-intervention 58 out of 62 (94%). In addition, on the short test post-intervention, her computation work provided evidence of her increased use of the strategies she had been taught in the math sessions for solving math problems. The teachers made the following comments on Student I's during the intervention period.

At her entry into our school, Student I could count rote count to ten out loud. However, she didn't understand what the numbers meant. In particular, she had difficulty in understanding the differences between the numbers 7 and 8. It was as late as January when she no longer confused the two. But now in March just a few months later, she is able to successfully complete the math calculations that are expected to be learned by in the first grades. She routinely chooses her own worksheet and completed them with a clear "I can-do it spirit". Whenever she encountered difficulty understanding or completing math work, she came to me and said, "I don't understand. May I use tiles for manipulation?". I think is a good change. She may not understand abstract words, but she benefit from hearing from her peers comments and questions. This type of learning never occurs in the one-to-one lesson in the special classroom. I am very happy that I can share the remarkable progress of Student I with you.

Case 3: Third Grade Classroom in H School

The setting of case 3 was a third grade classroom at H school. A two-month (i.e. October and November) period of consultation for this class was conducted. A full description of the work with Case 3, as noted earlier, is provided using the following sections: characteristics of teachers and students, the intervention phase, and the follow-up phase.

Characteristics of teachers and students

A homeroom teacher taught the math class. The female homeroom teacher, who was in her early 40's, and had a certification of special needs education, but no teaching experience in teaching students with special needs in special classrooms. While there were 32 students in this class, the teacher reported that there were two students who had diagnosed as having mild disabilities; one was ADHD, and the other was LD. In addition, there was a student who came from Brazil and had limited Japanese proficiency. The teacher reported that much of her attention was regularly directed to the same 5 students. Some of the concerns noted by the teacher for these 5 students were as follows; "having difficulty in concentrating on the task", "having difficulty in understanding new topics", and "causing a lot of troubles with friends by his unexpected behaviors and remarks". When the teacher was asked what kinds of supports she was providing to these students, her answer was "providing individual instruction during the independent work time when students were completing worksheets".

Three math class session observations, during which extensive field notes were collected, were conducted during the baseline period. The primary instructional model used by the teacher was a traditional Japanese instructional style, which emphasized whole group lecture. However, during the class sessions, she was providing learning activities, which involved

manipulative and body movements, and encouraged them to think and speak their ideas by their own words. The students seemed relaxed and active in the class sessions. However, there was an impression that goals of each lesson were not focused enough for both the teacher and the students.

Intervention Phase

The intervention phase of the work with the Case 3 teacher and students is presented in the following sections: the planning process, changes in teachers' performance, changes in teachers' perception, and changes in students' performance.

Planning process. The intervention planning process as implemented with Case 3 is presented below. Specifically, the process is explained across four specific components: teachers' teaching practice self-assessment checklist, planning meeting, establishing goals for the teachers, and consultation plan.

Teachers' teaching practice self-assessment checklist. Table 10 provides a copy of the teacher's pre-intervention phase completed "self-checklist for teaching practice". In reviewing the first column, "we practice this", the teacher reported that of the 30 items lists for the seven categories, there was only one item not used. It was in the area of "Assessment", "Level of attainment is clear for individual students with diverse objectives". Moving to the second column, the teacher noted that there were 6 items she checked that she practiced but unsuccessful. One was in the area of "Setting objectives", one is in "Instructional Delivery", two is in "Materials", one is in "Staff roles and student support", and one is in "Assessment". Her self-evaluation was high in the area of "Foundation for the class", "Curriculum", and "Student participation". Moving to the third column, the teacher notes the level of need (i.e., low level of need, middle

level or high level) for the “teaching practice”. It is notable that she considered all the items in the area of “Assessment” as middle level of need. Among the 6 items she noted that she practiced but unsuccessful, she considered the 3 items out of the 6 as “high level of need”, and considered the other 3 items as “middle level of needs”. The 3 items, which she considered as high level of need and she noted that she didn’t practice well, were as follows;

Teachers set objectives according to the learning needs of diverse students, Teachers provide instructions in a variety of ways, and Teachers provide appropriate level of instructional support to individuals.

Planning meeting. A planning meeting was held with the participant teacher, the school principle and the investigators. The teacher expressed concern that although she wanted to deal with individual student with various needs, she felt “*There is a limit to what the one teacher can do*”. As to the objectives for the consultation, she expressed her preference that she might focus on the items from the area of “Foundation of the class”, which she checked that she had already practiced successfully. In response, the school principal and the investigators expressed a hope that since she was such a competent teacher, she would take on new challenges that she had never tried. Finally, the teacher chose two items. “Teachers set objectives according to the learning needs of diverse students”, which she considered as high level of needs, but she practiced unsuccessfully, and “Teachers provide appropriate learning materials for individual needs”, which she considered as middle level of needs, and she practiced unsuccessfully.

As to the item of “Teachers set objectives according to the learning needs of diverse students”, the teacher mentioned current challenges and future hope.

Currently, in my mind, I divide students into three groups; students with difficulty in

understanding, students with average level of understanding, and students with advanced level of understanding. I hope that I can treat them in more individualized way. I 'm afraid that sometimes I might overlook needs of the students in “average level of understanding”, when they were having difficulties.

In addition, as to the item of “Teachers provide appropriate learning materials for individual needs”, the teacher felt that it was challenge for her to provide appropriate materials for individuals, not the materials in common. The investigator suggested that the students might have ability to know their own needs, and they might choose materials according to their needs.

Establishing goal for the teachers. During the planning meeting, the teachers together with the investigators targeted two goals for the teachers. The goals selected were: 1) teacher set objectives according to the learning needs of diverse students, and 2) teachers provide appropriate learning materials for individual needs. The team then developed a five level goal attainment scaling (GAS) to monitor the teachers’ change in teaching. The GAS steps for the first goal were as follows: 1) One goal is set for the whole class, 2) One goal is set for the whole class, and teacher gives individual instructions for the students who can’t achieve the goal, 3) Goal is set for the students with difficulties in learning, 4) Goal is set for students with some concerns, and 5) Individualized goals are set for all students including students with advanced level of understanding. The GAS steps for the second goal were as follows: 1) Use one material for whole class, 2) Supplemental teaching materials are provided to the students with difficulty in learning, 3) Supplemental teaching materials are provided to the students with some concerns when needed, 4) Student would decide if he/she needs to use supplemental teaching materials, 5) There is a system in the class that all students may use supplemental teaching materials when

he/she needed. The GAS was then used to support the teachers in self-monitoring their “learning” and achievement of the target goal.

Consultation plan. A consultation plan was developed based upon information gathered during the class observation, the teacher completed “self-assessment checklist”, and the discussion during the planning meeting between the teachers and the investigators. The teacher had established her teaching style, which emphasized students’ active participation. The teacher encouraged the students to speak their ideas by their own words, and answered to all students’ comments smilingly. She seemed to have built stable relationships with her students as a result of balanced classroom management, and it was also seen in her self-checklist. That is, she considered all seven items in the group of “Foundation for the class” as “high level of need”, and she noted that she was practicing all the items successfully.

At the same time, the teacher felt limitation of her teaching style when she tried to meet all the various individual needs of her students. The two objectives for the consultation, “Teachers set objectives according to the learning needs of diverse students”, and “Teachers provide appropriate learning materials for individual needs”, were considered to bring the teacher new skills to go beyond the limits of her current teaching style. Since the teacher had established fundamental teaching skills already, it was expected that there would be little confusion for her to introduce some new teaching practices.

The investigators decided that in the consultation, the investigator would collaborate with the teacher to come up with a creative solution of how to go beyond “*limit to what the one teacher can do*”. Specifically, the investigators planned to propose “multiple stages of supports” and “choice making by students” at the beginning of the consultation, which had been the

effective practices in the Case 2. Another important issue was the ways of communication with the teacher. In addition to the communication by emails, the investigators planned to talk with the teacher over the phone every time after the videotape observation, trying to consult with the teacher about her questions and concerns.

Changes in Teachers' Performance. As noted earlier, Goal Attainment Scaling (GAS) was used for monitoring the teachers' teaching practices during baseline, intervention, and follow-up phases and is displayed in Table 11 and 12. The analysis of the qualitative data (i.e., consultation meeting minutes, discussion of the GAS scales, math-class observation field notes) reveals that during the intervention phase, the changes in teaching practice could be divided into the following three time-based phase change themes: 1) Trying to Understand Meaning of the Practice, 2) Goal Setting and Introduction of Supplemental Materials Based on Assessment, and 3) Evolution toward student directed learning. In addition, within each of these phases the changes noted could be organized into three broad instructional strategy themes: a. goal setting based on assessment, b. multiple stages of supports utilizing supplemental teaching materials, and c. student directed learning. The presentation of the results for Case 3 will be organized using the time-based phase change themes and the instructional strategies themes.

Trying to understand the meaning of the practice – Sessions 1 & 2. The first time-based phase change theme included the time period just after the planning meeting as the teachers took time to understand the meaning of the new practices, which were set for her goals.

At first, the teacher didn't recognize the urgent need of students' goal setting according to their level of understanding, and didn't fully understand the concept of supplemental teaching materials. For this reason, her effort was not reflected as her progress on GAS steps. On this

matter, the investigators took long time for discussion with her over the phone.

Goal setting based on assessment. The learning content in the first lesson in the intervention period was multiplication. The teacher reviewed single-digit figure multiplication tables, which all the students were suppose to memorize in the second grade in Japan, and tried to move to the next step of two-digit figure multiplication. However, for the students, it was the first time in the third grade to learn multiplication. Some students could not continue reciting multiplication tables to the end, and just looked at the tables on the blackboard.

At the consultation time after the session, it was found that teacher had not assessed each student's level of understanding multiplication before that class session. The teacher told that she usually evaluated students' level of understanding at the very end of the learning unit, only one time. For the students with learning difficulties, although the teacher was trying to give individual instruction during the individual working time, she had conflicting feeling that it was impossible for one teacher to deal with all the students' needs. On this point, the investigators suggested her that with her current teaching style, it might be difficult to narrow the gaps in levels of understanding between the students, and that it might be better to assess students' levels of understanding at the beginning of the unit, then to give them differentiated instructions.

Multiple stages of supports utilizing supplemental teaching materials. In the second session, the teacher used big blackboard for explaining calculation of multiplication for whole class. She didn't use any manipulative teaching materials, because she thought that all the students were in the level of abstract thinking, and beyond the level of manipulation.

During the consultation after the session, she was asking the meaning of "supplemental teaching materials". The investigators explained that they were the materials which would

support student' understanding. For example, some students might feel comfortable and be helped by manipulative materials or paper with grid for calculation on their own desks, when teacher was explaining abstract concept.

Student directed learning. In the second class session, the teacher asked the students to work with peers to compare calculation of multiplication, and the students were actively participated in comparing answers with peers. However, most activities were controlled by the teacher. Upon completing the worksheet, each student brought his/her worksheet to the teacher's desk for scoring, and the teacher gave score and feedback to each student on the spot.

During the consultation after the session, the investigator proposed that the students might be able to choose the worksheet of their own level of understanding. The teacher expressed her concern that although students might be able to choose the worksheet, they would compete on the speed and number of worksheet they could complete.

Goal setting and introduction of supplemental materials based on evaluation – Sessions 3 through 5. The second time-based phase change theme started with the third math session and continued through the fifth session. It was during this time that the teacher came to understand effectiveness of goal setting based on assessment and introduction of supplemental teaching materials, and she creatively devised various supplemental teaching materials that would enhance the learning of students who were experiencing difficulty.

Goal setting based on assessment. For the third session, the teacher prepared several types of worksheets with previously learned contents in the current unit, and each student chose the worksheet that he/she liked, and kept on working with one's pace. For the teacher, this activity had a function of evaluation on students' understanding. The teacher commented the

positive aspects of this activity.

I used to give test and to evaluate students understanding at the very end of the learning unit. Today, I did evaluation session in the middle on the unit. I found it very helpful, because now I know who is having difficulty in which question, and some advanced student can go further in his/her own pace. I'm very glad I did.

Later, the learning unit of fifth session was charts and graphs. It was observed that the teacher checked whether some students with concerns had fully understood the learning contents at the several key points during the sessions. In addition, in this phase, the teacher started writing an objective of the session on the blackboard, and made the students even more conscious of what they were going to learn on that session. However, the teacher realized that she still needed to work for goal setting for the students of advanced level.

Multiple stages of supports utilizing supplemental teaching materials. In the third session, the students chose worksheets by themselves for reviewing previously learned contents. The teacher had prepared multiplication tables for the students with difficulty in memorizing multiplication. She also provided tips cards for the students with difficulty in story problems. Later, the learning unit of session 5 was charts and graphs, the teacher used pictures of various fruits as supplemental manipulative materials. She also invented a supplemental teaching material that named “scaling helper”, which would help reading scales of bar graph. She provided them to the students who had requested. She was happy to know that more than 20 students requested the “scaling helper”. Some students utilized them every time when they had bar charts. The other students utilized them at first, but quit to use them after acquiring skills to read scales easily. It seemed that in the class, the students felt comfortable and natural to use

supplemental teaching materials when they felt they needed them, which was becoming to the classroom culture.

Student directed learning. In the third session, the students chose worksheets by themselves for reviewing previously learned contents. At the beginning of the activity, the teacher explained to the whole class that the important thing was not speed or number of completed worksheets, but accuracy. The teacher put up correct answers on the blackboard, and asked students to score the completed worksheet by themselves. The teacher developed the system that the students come to the teacher only when they had any mistakes found by self-scoring, so that the teacher could give intensive instructions to the students who had difficulties with certainty. It was the first time for the teacher to let the students choose the worksheet. Before starting the activity, the teacher was skeptical if the system would work well, but she was very relieved to see that all the students cheerfully engaged in this activity.

Evolution toward student directed learning session— Sessions 6 through 8. The third time-based phase change theme started with the sixth math session and continued through the eighth session. It was during this time that the “goal setting based on assessment”, and “multiple stages of supports utilizing supplemental teaching materials” came to work together to help developing a style of student directed learning. Finally, the teacher came to establish these teaching practices as her own lesson style.

Goal setting based on assessment. In the sixth sessions, the teacher implemented wrap-up worksheet activity on the contents of charts and graphs. During this session, the teacher set concrete goals for each of the 6 students specifically, who had difficulties in learning, who had some concerns in learning, and who had advanced level of understanding. At the end of the

session, it was found that all their goals were achieved. For example, K is one of the students with some concerns, and the teacher set a goal of “solve questions with confidence”. After the class, the teacher reviewed his case.

Since K had some wrong answers in the first worksheet he chose, for the next one, I advised him to do the worksheet of more basic level, which he could do with confidence. If I were my old self, before starting this consultation, I would keep pushing him to do the questions that he couldn't solve.

At the consultation after this session, the investigator suggested the teacher that along with the goal for the whole class, each student might be able to set his/her own goal at the beginning of the session. In addition, each student might be able to review if he/she could achieve the one's own goal.

On the session of new learning unit of “large number”, the teacher reviewed the contents from the second grade, assessed each student's understanding and difficulties, and then moved to the new contents for the third grade. She also took time for the students to set own goals at the beginning of the session, and to review and self-evaluate the individual achievement at the end of the lessons.

Multiple stages of supports utilizing supplemental teaching materials. In the sixth session of wrap-up worksheet activity, 5 types of the worksheet with different target objectives were prepared. At first, the students were asked to try comprehensive version, and self-check the answers. The teacher told the students that if they had mistakes, those mistakes were telling them which contents they needed practice more. Then the students went to the next worksheet based on one's target objectives. This system was considered the multiple stages of support according

to individual needs.

Supplemental teaching materials, such as “scaling helper”, and manipulative materials, such as “plates and fake strawberries”, were set at the corner of the classroom. The students freely came to the corner to utilize them individually, when they felt they needed to use them for solving the questions.

Student directed learning. The teacher introduced some group activities and paired activities of the game style, for the purpose of better understanding the concepts, or practicing skills through repetition. Each student was actively engaged in and playing own roles in these learning activities. It was observed that the student proposed creative ideas through group discussion, or were practicing leadership and followership in the group. In the group activity in the third phase, much more students’ initiatives were seen than those in the first phase.

Through the worksheet activity reported above, the students individually realized which contents he/she understood well, and which contents he/she needed more practices. In the third phase, individual students became more aware of one’s strength and needs, and were able to set own goals. The students with different level of understanding, including students with difficulties in learning and students with advanced level of understanding, could keep learning with his/her own pace. The students also know by themselves that whether they need supplemental teaching materials on what types of the questions.

This system of student directed learning seemed to be well established in this class. It was observed that “goal setting based on assessment”, and “multiple stages of supports utilizing supplemental teaching materials” came to work together to help developing this style of student directed learning.

Follow-up Phase

One month following the end of the intervention phase, two math sessions were observed. In the both 2 sessions, it was observed that the teacher practiced acquired practices of goal setting based on assessment, and system of utilizing supplemental teaching materials. Utilizing worksheet system with multiple levels and various targets, each student set this/her own goals at the beginning, then review and self-evaluate at the end of the sessions.

Changes in teachers' perception. In order to understand the changes that occurred in teachers' perception as a function of the intervention, two sources of data were analyzed: (a) changes in the "Self- Assessment Checklist for Teaching Practice" completed pre and post intervention by the lead teacher, and (b) the teachers' reflections presented during the post intervention interview.

Changes in Self-Assessment Checklist. Three clear changes on the teacher's completion of the "Self-Assessment Checklist for Teaching Practice" pre and post intervention were noted. First, at the pre-intervention, the teacher considered all items in the area of "Assessment" as "middle level of need ". At the post-intervention, she considered those items regarding assessment as "high level of needs". The teacher was very conscious of the changes in her teaching practices.

The biggest change in my perception is the importance of assessment and evaluation. I used to consider that we needed evaluation just once, at the very end of the learning unit... but I was wrong. Now I would check this student today, because she didn't do well in the previous session. Based on the continuous evaluation, I try to make a lesson plans to make them understand within the lesson hours, not the outside of

hours of sessions.

Second, at the pre-intervention, the teacher checked all the items from “Foundation for the class” as “high level of need” and she noted that she was successfully practicing all. At the post-intervention, she noted 3 items from “Foundation for the class” as she practiced unsuccessfully. On this matter, the teacher explained, “ I might become harsh in self-evaluation after the consultation”.

Third, as to the items of “teacher set objectives according to the learning needs of diverse students”, and “teacher provide appropriate learning materials for individual needs”, which were the goals of this consultation, the teacher still noted as “I practice the item, but it was unsuccessful”. Objectively, from the observation during intervention period, her teaching skills on these items had been much improved. The teacher explained on this matter. “ *I might become to set high goals for myself after the consultation...I think I could have done more.*”

Teachers’ reflection. After the intervention, the teacher looked back her teaching practice, and expressed what she learned through the consultation. The first theme was various levels of goal setting for students.

For these several years, I have realized that there is a limitation in whole class instruction style, but I didn’t know how I could change my teaching style. Before the consultation, I thought it was impossible to deal with various needs of individuals by one teacher. I was thinking three groups of the students needs. However, this consultation taught me that goal setting can be differentiated according to individuals. I learned that it is important to provide ranges of choices.

As a result, the teacher came to think that it is possible for one teacher to deal with individual

needs.

Before the consultation, I couldn't do anything for the students with advanced level of understanding. Now I am able to expect what they could do and appropriate goals for them. I am paying attentions to the students with some concerns. Now I am able to set goals for them, and learned strategies regarding when and how I would instruct them as pinpoint treatment.

Finally, the teacher expressed the importance of self-confidence in the students.

If I had a student with difficulty in understanding in the math-class, my previous idea was like this; "OK, I can teach him after school or recess time". But through the consultation, I come to think that it is very important for the students to have confidence in learning. I'd like students to learn joy of learning within this math-class session hour.

Changes in students' performance. In order to understand the changes that may have impacted the students' performance as a function of the intervention, three sources of data were analyzed; (a) post- intervention scores on a standardized academic achievement test in mathematics which is designed to test the students' knowledge of the content from the previous or current grades; (b) pre- and post-intervention scores on Q-U Assessment (Kawamura, 2002) for assessing the level of socialization and motivation for each student in a classroom, which is a standardized psychological assessment developed and used in Japan; and, (c) review of students' academic products pre-intervention and throughout the intervention, such as worksheets and short tests or quizzes, and comments from the teachers on the products. One of the students who was struggling to learn the content (i.e., Student K) was selected by the teachers, and her pre-

and post- student performance data is reviewed in detail to add to our understanding of the potential impact of the changes in the teachers' instructional strategies.

Standardized academic achievement test. The second grade level of the academic achieving test was conducted before the intervention (i.e., July), and the third grade level of the academic achievement test was conducted after the intervention (i.e., February), near the end of the school year. As presented on Table 13, there is no noticeable change in the average class scores between the pre and post academic achievement test. However, in the scores of Student K, improvement was observed in the areas of “mathematical thinking”, “processing quantities and figures” and “knowledge about quantities and figures”.

Q-U assessment. The *Questionnaire of Q-U* assessment consists of two sub-scales. One sub-scale addresses satisfaction with classroom life, and the other motivation for school life. Table 14 displays the results of “satisfaction of the classroom life” scale. Each student in the class would belong to one of the 4 groups. According to Kawamura (2002), students in “satisfied with classroom life” group likely have good relationships with his/her classmates, and show high levels of motivation for learning. Students in “not fully accepted by their classmates” group may not have any specific complaints but may not enjoy their school lives. They may be inconspicuous in their classrooms. Students in “receiving invasive behavior” group may have trouble with forming positive relationships with their classmates. He/she may have strong victim mentality, or egocentric feeling. For the second and third groups, it is recommended that additional supports be provided by teachers to facilitate their becoming well adjusted members of the class. The fourth and final group, those “dissatisfied with classroom life” should be provided with the most intense and extensive support. These students may experience bullying

from their classmates and may show little, motivation to learn, which worsen across time.

The Case 3, at pre-intervention, had 47% of the students in the “satisfaction of classroom life” group, which was higher than the national average of 41%. At the point of post-intervention, one student added in this group and percentage of this group became 50%. There need to be noticed that at the point of pre-intervention, 30 % of students were in the group of “dissatisfaction of classroom life” group. The percentage decreased at the point of post- intervention (23 %). It is said that in the most intensive care should be needed for the students. Student K was in this group at the both points of pre- and post- intervention.

Table 15 displays the results of second sub-scale, “motivation for school life”. The average scores of the Case 3 Class were similar to national average and it was not seen notable differences in scores between pre- and post intervention. As to student K, after the intervention, scores became higher in the area of motivation for learning and relationships with friends.

Academic products and teacher’s comments. The teacher was very disappointed to know that there was not notable change in scores of student K on the Q-U scale for satisfaction of classroom life. Both at the point of pre- and post-intervention, he belonged to the “dissatisfaction of classroom life” group. The teacher commented:

K tends to think very negatively. He doesn’t like being pointed out by others, and overreact to everything. Changing negative thinking like this into a more positive line of thought can be a difficult thing to accomplish...

However, the teacher noticed positive changes in his academic achievement as well as relationship with others. She commented that Student K came to get high scores on small quizzes in the learning unit, which seemed to give him great confidence in learning. Along with his

confidence in learning, teacher noticed some changes in his behaviors. He came to talk to the teacher more often and express his feelings to her.

The teacher commented the relationship of academic achievement and behaviors in the classroom of student K as follows:

In my opinion, there is academic achievement in the first place. If he doesn't understand lessons, he feels uncomfortable staying in the class and causes trouble with other friends. I learned that it is very important for the students with difficulties in learning, like student K, to have confident in learning, by utilizing supplemental materials. He said "I can do it with this scaling helper!", I think this was the big turning point for him.

CHAPTER 5

Discussion

In this chapter, based on the results of the three cases, the significance of supporting teachers in implementing UDL principles into math classes in Japan will be discussed. After reviewing the cases, implications for practice, implications for future research and limitation of the research will be discussed.

Case Discussions

In this section, the results of each case will be summarized in terms of changes in the teachers' performance and perceptions, and changes in the students' performance. Subsequently, the cases will be compared in chronological order highlighting the similarities and difference in an effort to extract the common and unique themes across the cases as they implement the UDL principles into math classes in Japan.

Case One Summary. A key characteristic of Case One (Third Grade Class in S School) is that although the teachers improved their teaching practices (e.g. developing instructional materials, and teachers' collaboration) during the intervention phase, they did not maintain their improved teaching practices post intervention. During the intervention phase, the two teachers successfully developed instructional materials that supported students' learning, and used them together as a collaborative team. As a result, the students improved their level of engagement. However, the lead-teacher's returned to the teaching approach that she had previously used and had been observed in the baseline phase. In tandem with changes in the teachers' instructional practices, the high level of students' engagement was seen only during the intervention phase.

Reasons for this regression might include that the intervention failed to convince the

lead-teacher of the effectiveness and needs of the target teaching practices. At the beginning of the intervention phase, she tried hard to apply the suggestions of the investigators into her math lessons, but there was some concern that she didn't fully understand the suggested practices. She also expressed feeling stressed by having to participate in the weekly observations and the video recording. Further, she noted that sometimes she found the investigators' suggestions confusing. The shift in the teacher's thinking could be characterized by the following themes - one point during intervention feeling "nearly out of balance" to "do it in my own way". Initially this change in her attitude appeared to signal that the teacher felt confident in being able to implement the strategies without assistance because she had embraced the approach. However, it became clear that the implementation of the target practices was more of a rote implementation of "doing what I'm told" rather than an indication that she had applied UDL principles into her philosophy of teaching and learning. Unfortunately, the intervention did not appear to have affected the teachers' perception of instruction in fundamental ways. That is, the investigators failed to convince the teachers of the importance of providing a primary level of differentiated support, that is, the focus of UDL strategies is not on the students with difficulties in learning only, but on all students in the classrooms.

The big challenge for the investigator is how to support the many teachers who may well have similar view as the lead teacher in Case1. According to the school principal, the lead teacher might well not have been a good judge of her own teaching skills. In addition, she was noted to be very nervous when she was observed by the investigator and appeared to take the investigators as critical of her current teaching. A possible solution would have been to focus the consultation more directly on assisting the teachers on engaging in active self-reflection of their

teaching such that suggestions for changes came from their self identified needs. Furthermore, it is possible that the use of a consultant that was a colleague of the participants rather than an outside consultant would have eased the sense of being evaluated. “A consultant” doesn’t have to be a specialist outside of the school, but a colleague of the participant teachers who could have more frequent and natural conversation discussing and reflecting on the lessons.

A limitation encountered in Case 1 was that it was impossible to collect enough data for examining changes in the students’ academic performance. This was considered in planning for initiating the work with the Case 2 teachers and students.

Case Two Summary. A significant challenge encountered in working with the first grade classroom in S School teachers and students (i.e., Case 2) was that nearly half of the students in the class had some learning difficulties. Because the teachers’ instructions focused on those struggling students, the pacing of their lessons was considerably slower, which thus was not appropriately meeting the needs of the students who learned the concepts more quickly. The teachers were eager to learn strategies for teaching both groups of students to insure that all children were having their individual needs met and were learning.

The recommended instructional strategy was that the materials and instruction are developed and implemented to address a variety of proficiency and content levels, and that the students are provided a choice and make use of the choice for selecting learning materials. The real challenge for this case was how best to implement the differentiated instructional principles of UDL into the Japanese school culture and values of focusing on whole group instruction. The result was that the teachers successfully came to implement and integrate the recommended UDL strategies into their teaching and learning philosophy grounded in the value of collectivism. The

students achieved a high level of academic performance and were generally comfortable students staying in the classroom for their math lessons. In addition, there were clear changes in lead-teacher's perceptions towards the UDL principles. After the intervention, the number of items on the self-assessment checklist which the teacher considered to be of a "high level of need" had increased from 19 to 26, including: "Teachers set objectives according to the learning needs of diverse students", "Teachers provide instructions in a variety of ways", "There are opportunities for hands-on activities for students", "Teachers plan peer-teaching or team-activities for all students' engagement", and "Teachers assess students learning using multiple methods during class".

Interestingly, all of these practices came to be observed in the lessons of Case 2 during the intervention phase, although they were not targeted goals for the teachers. A compelling explanation is that while pursuing the specific goal, which was essential to implementation of the UDL principles, the lead teacher achieved a fundamental understanding of the UDL principles and fully incorporated them into her teaching practices.

Three additional important themes were noted in this Case. First, it was apparent that as a function of the consultation (i.e., intervention phase) the teachers had learned to how to introduce math concepts in a stepwise level to meet the current range of developmental levels presented by their students while maintaining a whole group instructional model. This instructional approach proved to be very successful for the first graders, especially for this class in which nearly half of the students had some learning difficulties.

Second, the teachers introduced "choice making by students", which was a completely new idea for the teachers. As a result, the teachers found that the students became more active,

energetic, and engaged in the learning activities when choice making was provided. In addition, the lead teacher commented that she now was more aware of some of the students' abilities of which she had not previously aware. The teacher stated, "*I realized that even first graders know their own capability and needs.*", acknowledging the positive aspects of incorporating student directed learning.

Third, the teachers came to recognize the importance of having conducting their lesson with the whole group because to the power of group dynamics. The teacher mentioned that during the intervention phase, one of the students with learning difficulties improved both academic skills and social skills as a function of the group dynamics, which might have not been accomplished in a special class.

Comparing and Contrasting Case 1 and Case 2. Three themes are notable in comparing and contrasting Case 1 and Case 2. First, an important difference between the teachers in Case 1 and Case 2 centered on their ability to reflection on their own teaching. The lead-teacher in Case 1 tried to apply the investigators' suggestions directly, without thinking if it is compatible with her own teaching style or philosophy of teaching. During the intervention phase, although she developed many instructional materials, the changes in her practices were mainly quantitative, but not qualitative. It is quite possible that high level of self-reflection skills might be required in order to fully incorporate the UDL principles into one's own teaching style as was seen in the practice of the lead-teacher in Case 2. Thus, it may well be the case that, the approach to consultation and supporting teacher's implementation should assess the teacher's levels of self-reflection and modify the approached to fit.

The second theme that arose from these two cases was collaboration or the need of the

two teachers assigned to the class to work together as a team. In both cases, two teachers were assigned to the math sessions and thus had to work together collaboratively to provide the appropriate supports for all students and implement the suggested changes. This working together certainly had to be considered by the consultants as they introduced the suggestions and provided on-going support. In most Japanese schools, however, math classes are taught by a single teacher. It was therefore, important to include a class in which there was only a single teacher to understand the differences that might arise. Case 3 was thus selected as a class taught by single teacher.

The third and final common theme noted across Case 1 and 2 was that for both classrooms the school principal was component leaders and had a particularly strong commitment to special needs education. In addition, the school was relatively small and located in rural area. All three of these factors could have served as facilitating conditions. Again for the third case a school that did not have these factors in place was chosen (e.g., large size located in city area).

Case Three Summary. Case 3, third grade classroom in H School, was located in a suburb of a large city, and the math class was taught by only a teacher. Although the teacher wanted to deal with individual students and address their various needs, she felt that “*There is a limit to what the one teacher can do*”. Two goals were set for this teacher; set objectives according to the learning needs of the range of learning needs presented by her students and provide appropriate learning materials for meeting individual needs. Both goals were a challenge for her, since at baseline, the teacher only had one learning objective for the whole class and offered only one instructional material to be used by all the students in her class.

As a result of the intervention, the teacher successfully attained her goals. In addition, changes in teachers' perception about her roles and responsibilities in teaching were observed. The academic achievement test scores of the student with learning difficulties and behavioral issues improved following the intervention.

Four key themes were noted for Case 3. First, the teaching style that the teacher had developed in Case 3 could be a model style when a single teacher teaches a whole class of 30 students, which is current standard class size in Japan. In Case 3, the teacher established a lesson style as follows; identifying the whole class goals of the lesson; understanding new concepts and skills by using group or peer activities; and individually practicing skills by utilizing multiple levels of teaching materials. Supplemental teaching materials were chosen by individual student according to his or her own needs. In addition, students could set their own goals and evaluate their learning by themselves, and developed a style of student directed learning. Focusing on the whole group dynamics and insuring pursuit of individual learning seemed to be well combined in this teacher's approach, which was compatible with the Japanese educational value. Further research will be required to better understand whether this model could be acceptable by a larger group of elementary teachers in Japan.

The second, theme had to the notion that there might be some prior conditions that need to be in place in order to introduce the recommended teaching model. Already during the baseline period, the teacher in Case 3 demonstrated a teaching style in which she encouraged her students to think and express themselves. Furthermore, she was observed to convey a respect for each student and appeared to have good relationships with individual students. Thus, it may well be that ensuring that evidence of well established student teacher relationships and sound

classroom management approaches are a necessary foundation to the successful implementation of UDL principles.

The third theme for Case 3 was the significant shift observed in the teacher's perception of specific aspects of instruction post intervention. That is, the teacher came to view the statement "importance of individual goal setting based on evaluation" as high level of need in her classroom, which she had not practiced before the intervention. When Japanese teachers give lessons by following the national curriculum, they might think that there is only one goal for the class for all students in same grade. The realization of "importance of individual goal setting based on evaluation" might be a key concept for Japanese teachers to understand when they try to apply principles of UDL. Another change noted in the teacher was that at post intervention, the teacher became much more critical of her own teaching practices. That is, the teacher mentioned, *"I might come to set high goals for myself...I think I could have done more."* This statement demonstrates a potential shift in the teacher's ability to reflection on her teaching post intervention.

The fourth and final theme, the teacher realized the close relationship between improvement of academic skills and development of social skills. In supporting a student with learning difficulties and challenging behaviors, she learned that *"there is academic achievement in the first place. If he doesn't understand lessons, he feels uncomfortable staying in the class and he causes trouble with other friend. It is very important for the students with learning difficulties to have confident in learning with supplemental materials."* She mentioned that this confidence increased his engagement in the math class, and decreased his challenging behaviors.

Comparing and Contrasting Case 1, Case 2, and Case 3. Comparison of Case 1,

Case 2, and Case 3 revealed four themes. The first theme centered on the, positive outcomes of the intervention (i.e. changes in teachers' practices, changes in teachers' perception and changes in students' performance) which were observed in Case 2 and Case 3, but not in Case 1. This difference might be attributed to the fact that the consultation did not facilitate the teachers' successful self-reflections on their math instruction. In the successful cases (i.e. Case 2 and Case 3), it was observed that the teachers often externalized their own values in teaching and learning, tried to understand the importance of the UDL principles, and contemplated how they could apply these new principles to their own. For the Case 1 teachers, unfortunately, the consultation failed to facilitate that process.

Second, therefore, it is clear that a need exists to examine the appropriate style of consultation in response to the characteristics and needs of the teachers. In Case 3, the investigator kept more close contact with the teacher by phone call, which seemed to be a great help for the teacher. In Case 1 and 2, the main communication method with the teachers was emails, and for Case 1, the investigator failed to catch the confusion of the teacher in the early stages, which was regrettable. Upon introducing the consultation, the teacher's experience, preference, and level of self-reflection must be addressed in deciding upon the appropriate support style for the teachers.

Third, the successful cases, Case 2 and Case 3 have similarities and differences in their achieved teaching practice. Differences might come from grades of the students, needs of the students, or/and original teaching style of teachers, etc. Similarities were that both cases had features of well-established foundation of the class, goal setting based on evaluation, providing teaching materials to support individual needs, choice-making by students base on their

preference and needs, and building good relationship with peers. These two successful cases verified that in the Japanese school culture, which put emphasis on whole group dynamism, it is possible for teachers to employ teaching styles that focus on individual preference and needs. In both cases, there are great balance and interactive dynamism between focuses of whole group and individuals needs.

Fourth, in the all three cases, there were spreading effects from the classrooms to whole schools. Special needs education in Japan has started only recently, but teachers began to notice that all teachers and other specialists in schools needed to collaborate with each other to provide appropriate education for all students in the school. Additional teachers' interview revealed that the self-assessment checklist could be used not only for consultation, but also in the different occasion in the schools (e.g. in-service training, guide to lesson study) in the effort of teachers' sharing the same perspectives. There is a need to create a model of school-wide problem solving for education for all students. This study could be the first step for it.

Conclusion

This study investigated the impact of the consultation approach on teachers' teaching practice in terms of changes in their teaching practices and perceptions regarding UDL, and impacts of implementing UDL principles on students' outcomes. The biggest question was that whether UDL principles could be successfully applied to the Japanese school culture, which put emphasis on whole group dynamism. The two successful cases verified that it is possible to implement teaching practices with values of UDL principles in conjunction with positive aspect of Japanese collectivism values.

It was found that in the successful cases (i.e. Case 2 and Case 3), teachers' practices

demonstrated well-balanced focuses on both facilitating whole group dynamism and meeting variety of individual needs. Some common aspects that were observed in the successful cases were as follows; well-established foundation of the class, individual goal setting based on evaluation, providing teaching materials to support individual needs, choice-making by students base on their preference and needs, and building good relationship among peers. In addition, in the successful cases, changes in teachers' perceptions were observed; through the intervention, they came to consider these practices as high level of importance, and tried to implement them in creative styles.

Prior to the intervention, all the participant teachers had naturally practiced “one common goal for the whole class” and “one common teaching material and strategy for the whole class” in their lessons. Applying UDL principles is introducing individualization into whole group approach. The key to the successful intervention was whether the consultation could facilitate the teachers' self-reflections on each of their math session. In the successful cases (i.e. Case 2, and Case 3), it was observed that the teachers often externalized their own values in teaching and learning, tried to understand significance of the value of UDL principles, and contemplated how they could apply new values to their own. Unfortunately, for Case 1, the consultation failed to facilitate that process. There is a need to investigate appropriate consultation or other training styles for those teachers who have difficulties in self-reflection, and in applying new values to their own.

It was also found that in the successful cases, there were positive impacts on students' outcomes in both academic achievement and social aspects. There is some indication that there might be close relationships between these two outcomes. That is, when students with difficulties

in leaning and behavioral issues came to understand contents of lessons with supports from UDL practices, they gained more confidence in learning, and increase in engagement or/and decrease in challenging behavior. Another notable change in the successful cases was that the students' learning styles became more and more self-directed; the students were making choices according to their preferences and needs, setting their own goals and evaluating them, and being actively engaged in the learning activities.

Implications for Practice

The focus of UDL principles is not on the students with disabilities only, but on all students in the classrooms, which is primary level of support. This study demonstrated one solution of confusion in current elementary school in Japan, that is, how to implement special needs education in regular classrooms, and to support learning of all students in the classroom.

In order to assess teachers' own current teaching practices, and to apply UDL principles into their teaching practices, "Self-Assessment Checklist for Teaching Practice" can be introduced to Japanese elementary teachers. In order for better understanding of values of UDL principles, and successful application of them on their own teaching practices, it is recommended that the checklist should be utilized through consultation approach. Some other utilization, such as in-service training and guide to lesson study, were suggested by participant teachers. The key is to review with other teachers or professionals for better understanding of and sharing values of UDL principles.

Upon applying UDL principles, there may be a need for teachers to change their current teaching styles. It was suggested that the teaching style that had developed in Case 3 could be a model style when a single teacher teaches a whole class of around 30 students, which is current

standard class size in Japan. In Case 3, the teacher established a lesson style as follows; identifying goals of the lesson by whole class; understanding new concepts and skills by using group or peer activities; individually practicing skills by utilizing multiple levels of teaching materials. Supplemental teaching materials were chosen by individual student according to his or her own needs. In addition, students might set their own goals and evaluate their learning by themselves, and developed a style of student directed learning. Focusing on whole group dynamism and insuring pursuit of individual learning seemed to be well combined in this model, which can be acceptable in classrooms with Japanese educational value.

There are two plans for application of the results of this study into practice in Japan. One is utilization of existing systems for dissemination of the UDL principles, and the other is creating school-wide model of implementation of UDL principles.

The first one is utilization of existing systems for dissemination of the UDL principles. In this study, the consultation approach was taken by the investigators as a pioneering work. In order to disseminate and realize the concept of UDL principles into more elementary schools in Japan in an effective way, existing system for promoting special needs education in elementary school could be used. That is, official itinerant consultant system in Japan, operated at the municipal level, could be utilized for dissemination. Training programs for official itinerant consultant can be developed based on the process and findings of this study.

The second is creating school-wide model of implementation of UDL principles. Applying and introducing the UDL principles into elementary classrooms in Japan is huge innovative change in education. Teachers play important roles in implementing innovation, and appropriate supports for their professional development should be provided to them. Their

implementation of UDL principles would be monitored and encouraged, with sharing values with their colleagues. For this purpose, it is recommended the use of “Self-Assessment Checklist for Teaching Practice” for in-service training and for guiding lesson studies within schools to share values with colleagues.

Implications for Future Research

There are three topics regarding implications for future research. Those are; elaborating appropriate consultation systems for teachers with difficulties, and considering school-wide model with secondary and thirdly level of support for more advanced level of inclusive school.

The first issue is elaborating effective consultation (training) systems for teachers with some difficulties in acquiring concepts and skills regarding UDL principles. This case study revealed that there were participants teachers who didn't achieve positive outcomes through the consultation approach by the investigator. There are speculations that these teachers could effectively learn concepts and skills by different style of consultation (e.g. more frequent communication on the phone with consultant, utilizing resource within own schools for more casual style of workshops). Or, training of some basic teaching skills (e.g. items from foundation for the classes) might be required. Further research should be needed for elaborating effective consultation or training systems for some teachers with difficulties in acquiring concepts and skills regarding UDL principles.

The second issue is considering school-wide model with secondary and thirdly level of supports for more advanced level of inclusive schools. Currently, most of the students with special needs who are studying in regular classes in elementary schools are students with relatively mild disabilities, such as LDs and ADHDs, high functioning autisms. Although the

focus of this study was only primary level of support in regular classrooms in early elementary level, it would be necessary to develop school-wide model with secondary and thirdly level of supports for students who would require more extensive curriculum adaptation and intensive level of supports. Preparing for ratifications of Disability Conventions of United Nations, Japanese government is developing vision for inclusive schools, included students with more severe disabilities, and future study is needed in the vision of more advanced level of inclusive schools.

Limitations of the Research

There are some limitations of this research. Firstly, this research is only a pioneering work, and more factors need to be taken into consideration for actual implementation. In this study, the consultation approach was taken by the investigators as a pioneering work in Japan. For the purpose of shedding light on the process of application of innovative practices into Japanese culture, abundant qualitative data were taken from only 3 cases. For the actual application of the approach of this study, for example, utilization of official itinerant consultant systems for dissemination of the UDL principles, there are more practical issues to be taken into consideration (e.g. costs and frequencies of consultation, competencies of consultants).

Second, the procedure of goal setting for teachers and monitoring for teachers' progress needs more elaboration. Some goals and GAS steps established for the teachers were too complicated. For each class, teachers' self-monitored GAS and the investigators rated GAS from observation, and a final GAS score was determined by consensus between the teacher and investigator. Although the teachers and the investigators agreed with final scores each time, there was some confusion in scoring in the teachers at times.

Third, the data taken for students' outcomes were not consistent for three cases. This is because the investigator left taking and/or sharing individual data on students for the teachers to decide. In addition, for the two standardized test (i.e. achievement test and Q-U assessment), the appropriate time for implementation were already decided from the purpose of the tests (i.e. at the beginning of the school year and at the end of the school year), their data was used only for the indirect reference for students' outcomes.

Fourth, the original data of this study were taken and written in Japanese language, not in English. After compiling a paper in Japanese, it was translated in English by the investigator (Japanese doctoral students majoring in special education at University of Kansas), and then the native English speaker read the proofs. There might be some variance between the expression written in English and actual meaning of original Japanese language.

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Table 1. Result of Self-Assessment Checklist for Teaching Practice for Case 1

Checklist for Teaching Practice		We practice this	evaluation	We need to learn
I Foundation for the Class				
①	Teachers are drawing students' attention	○	○	◎
②	There are rules for students' listening and speaking	○	○	◎
③	There are consideration for students' keeping good posture.	○	○	◎
④	Teachers ask thoughtful questions that students would be interested in.	○	△	◎
⑤	Teachers have ingenuity in writing on blackboard	○	△	◎
⑥	Students feel free to ask questions	○	○	◎
⑦	Teachers provide positive acknowledgement to students.	○	○	◎
II Curriculum				
①	The link of the class/unit and the "big ideas " of the course is clear.			○
②	Other curricular area is addressed in the class.			○
③	The class/unit relate to outcomes for students outside of school	○	○	◎
III Setting Objectives				
①	There are general standards teachers are addressing in the class/unit.	○	○	◎
②	Teachers set objectives according to the learning needs of diverse students.	○	△	◎
IV Instructional Delivery				
①	Teachers provide instructions in a variety of ways.	○	○	◎
②	There are opportunities for hands-on activities for students.	○	○	◎
③	Teachers provide repeated practice on the key concept/skills.	○	○	◎
④	Teachers teach learning strategies to students who need supports.	○	○	◎
V Materials				
①	Teachers provide worksheets for individual learning-time.	○	○	◎
②	Teachers utilize assistive technology to maximize student performance.	○	○	◎
③	Teachers provide learning materials to understand key concept/skills	○	△	◎
④	Teachers provide appropriate learning materials for individual needs.	○	△	◎
VI Student Participation				
①	Teachers allocate time for students thinking.	○	○	◎
②	Teachers provide problem-solving activities.	○	○	◎
③	Teachers plan peer-teaching or team-activities for all students' engagement	○	○	◎
④	Teacher provide students with choice opportunities.	○	○	◎
VII Staff Roles and Students Support				
①	There are roles and responsibilities of the staff in the classroom.	○	○	◎
②	Teachers provide appropriate level of instructional support to individuals	○	△	◎
VIII Assessment				
①	Teachers assess students learning using multiple methods during class.	○	○	◎
②	Students have a variety of ways to express what they have learned.	○	○	◎
③	Teachers use ongoing assessment data to refine instruction for the next.	○	○	◎
④	Level of attainment is clear for individual students with diverse objectives			◎

Table 2. Result of Goal Attainment Scale Objective 1 for Case 1

Objective 1 Teachers devise teaching materials to help all students' understanding

Scales towards Objectives	9/21	10/19	10/31	11/7	11/14	11/22	11/30	12/6	12/13	1/18	2/15
⑤ Devise a material for students with learning difficulties and advanced students											
④ Devise a material for students with learning difficulties			●				●	●	●		
③ Use material for whole class, supporting students with learning difficulties				●	●	●					
② Explain learning contents by one material for whole class.	○	○								△	△
① Explain learning contents only by spoken words											

Note: ○ represents score for baseline phase (9/21/07-10/19/07), ● represents score for scores for intervention phase (10/31/07-12/13/07), and △ represents scores for follow-up phase (1/18/08-2/15/08)

Table 3. Result of Goal Attainment Scale Objective 2 for Case 1

Objective 2 Teachers cooperate in providing appropriate support for all students

Scales towards Objectives	9/21	10/19	10/31	11/7	11/14	11/22	11/30	12/6	12/13	1/18	2/15
⑤ Teachers provide appropriate supports in cooperation for all including advanced students											
④ Teachers provide appropriate supports in cooperation for students with learning difficulties			●				●	●	●		
③ Teachers provide some sort of supports in cooperation for students with learning difficulties				●	●	●					
② Teachers arrange role-sharing and work in cooperation	○	○								△	△
① Teachers don't arrange role-sharing											

Note: ○ represents score for baseline phase (9/21/07-10/19/07), ● represents score for scores for intervention phase (10/31/07-12/13/07), and △ represents scores for follow-up phase (1/18/08-2/15/08)

Table 4. Result of Q-U profile for Satisfaction with Classroom Life for Case 1

Groups	National average	Case 1 Class(N=31)		Student T	
		1 st (Pre)	2 nd (Post, N=30)	1 st (Pre)	2 nd (Post)
"satisfaction of classroom life" group	41%	52% (n=16)	37% (n=11)	X	X
"unaccepted in classroom" group	15%	19% (n=6)	17% (n=5)		
"receiving invasive behavior " group	18%	13% (n=4)	20% (n=6)		
"dissatisfaction of classroom life" group	23%	16% (n=5)	27% (n=8)		

Table 5. Result of Self-Assessment Checklist for Teaching Practice for Case 2

Checklist for Teaching Practice	We practice this	evaluation	We need to learn
I Foundation for the Class			
① Teachers are drawing students' attention	○	○	◎
② There are rules for students' listening and speaking	○	○	◎
③ There are consideration for students' keeping good posture.	○	△	○
④ Teachers ask thoughtful questions that students would be interested in.			◎
⑤ Teachers have ingenuity in writing on blackboard			◎
⑥ Students feel free to ask questions	○	○	◎
⑦ Teachers provide positive acknowledgement to students.	○	○	◎
II Curriculum			
① The link of the class/unit and the "big ideas " of the course is clear.	○	○	◎
② Other curricular area is addressed in the class.	○	△	○
③ The class/unit relate to outcomes for students outside of school	○	△	○
III Setting Objectives			
① There are general standards teachers are addressing in the class/unit.	○	○	◎
② Teachers set objectives according to the learning needs of diverse students.			○
IV Instructional Delivery			
① Teachers provide instructions in a variety of ways.			○
② There are opportunities for hands-on activities for students.	○	△	○
③ Teachers provide repeated practice on the key concept/skills.	○	○	◎
④ Teachers teach learning strategies to students who need supports.	○	○	◎
V Materials			
① Teachers provide worksheets for individual learning-time.			△
② Teachers utilize assistive technology to maximize student performance.			△
③ Teachers provide learning materials to understand key concept/skills	○	○	◎
④ Teachers provide appropriate learning materials for individual needs.			◎
VI Student Participation			
① Teachers allocate time for students thinking.	○	○	◎
② Teachers provide problem-solving activities.	○	○	◎
③ Teachers plan peer-teaching or team-activities for all students' engagement	○	△	○
④ Teacher provide students with choice opportunities.			◎
VII Staff Roles and Students Support			
① There are roles and responsibilities of the staff in the classroom.	○	○	◎
② Teachers provide appropriate level of instructional support to individuals	○	○	◎
VIII Assessment			
① Teachers assess students learning using multiple methods during class.			△
② Students have a variety of ways to express what they have learned.			○
③ Teachers use ongoing assessment data to refine instruction for the next.	○	○	◎
④ Level of attainment is clear for individual students with diverse objectives			◎

Table 6. Result of Goal Attainment Scale for Case 2

Objective Teaching materials/strategies are prepared by different stages, and students choose appropriate materials/strategies and make use of them

Scales towards Objectives	11/22	12/14	1/10	1/18	1/24	1/31	2/7	2/15	2/22	2/28	3/14
⑤ Students appropriately choose materials and strategies and make use of them											△
④ Materials and strategies are prepared by stages for students choice			●						●	●	
③ Materials prepared by stages, according to individual needs					●			●			
② Use one material and one strategy for whole class, working well for majority	○	○		●		●	●				
① Use one material and one strategy for whole class, not working for majority											

Note: ○ represents score for baseline phase (11/22/08-12/14/08), ● represents score for scores for intervention phase (1/10/08-2/28/08), and △ represents scores for follow-up phase (3/14/08)

Table 7. Result of Academic Achievement Test for Case 2 (post intervention only)

Areas	National average	Class average	student I
Interest and motivation toward mathematics	85.8	97.1	83
Mathematical thinking	84.1	91.6	66
Processing quantities and figures	91.2	96.7	72
Knowledge about quantities and figures	90.0	98.5	94
Average score for the last 3 areas	88.4	95.6	77.3

Table 8. Result of Q-U profile for Satisfaction with Classroom Life for Case 2

Groups	National average	Case 2 Class(N=27)		Student I	
		Pre(N=26)	Post	Pre	Post
"satisfaction of classroom life" group	41%	73%(n=19)	81%(n=22)	X	
"unaccepted in classroom" group	15%	15%(n=4)	15%(n=4)		X
"receiving nociceptive behavior" group	18%	8%(n=2)	4%(n=1)		
"dissatisfaction of classroom life" group	23%	4%(n=1)	0%(n=0)		

Table 9. Result of Q-U profile for Motivation for School Life for Case 2

Items	National average	Case 2 Class average		Student I	
		Pre	Post	Pre	Post
Motivation for Learning	9.8	10.9	11.4	9	11
Atmosphere of Classroom	10.2	11.3	11.6	12	10
Relationship with Friends	9.7	9.9	10.5	8	10

Table 10. Result of Self-Assessment Checklist for Teaching Practice for Case 3

Checklist for Teaching Practice		We practice this	evaluation	We need to learn
I Foundation for the Class				
①	Teachers are drawing students' attention	○	○	◎
②	There are rules for students' listening and speaking	○	○	◎
③	There are consideration for students' keeping good posture.	○	○	◎
④	Teachers ask thoughtful questions that students would be interested in.	○	○	◎
⑤	Teachers have ingenuity in writing on blackboard	○	○	◎
⑥	Students feel free to ask questions	○	○	◎
⑦	Teachers provide positive acknowledgement to students.	○	○	◎
II Curriculum				
①	The link of the class/unit and the "big ideas" of the course is clear.	○	○	○
②	Other curricular area is addressed in the class.	○	○	○
③	The class/unit relate to outcomes for students outside of school	○	○	◎
III Setting Objectives				
①	There are general standards teachers are addressing in the class/unit.	○	○	○
②	Teachers set objectives according to the learning needs of diverse students.	○	△	◎
IV Instructional Delivery				
①	Teachers provide instructions in a variety of ways.	○	△	◎
②	There are opportunities for hands-on activities for students.	○	○	◎
③	Teachers provide repeated practice on the key concept/skills.	○	○	◎
④	Teachers teach learning strategies to students who need supports.	○	○	◎
V Materials				
①	Teachers provide worksheets for individual learning-time.	○	○	◎
②	Teachers utilize assistive technology to maximize student performance.	○	△	○
③	Teachers provide learning materials to understand key concept/skills	○	○	◎
④	Teachers provide appropriate learning materials for individual needs.	○	△	○
VI Student Participation				
①	Teachers allocate time for students thinking.	○	○	○
②	Teachers provide problem-solving activities.	○	○	◎
③	Teachers plan peer-teaching or team-activities for all students' engagement	○	○	◎
④	Teacher provide students with choice opportunities.	○	○	◎
VII Staff Roles and Students Support				
①	There are roles and responsibilities of the staff in the classroom.	○	○	○
②	Teachers provide appropriate level of instructional support to individuals	○	△	◎
VIII Assessment				
①	Teachers assess students learning using multiple methods during class.	○	○	○
②	Students have a variety of ways to express what they have learned.	○	△	○
③	Teachers use ongoing assessment data to refine instruction for the next.	○	○	○
④	Level of attainment is clear for individual students with diverse objectives			○

Table 11. Result of Goal Attainment Scale Objective 1 for Case 3

Objective 1 Teachers set objectives according to the learning needs of diverse students

Scales towards Objectives	6/27	7/16	9/12	10/9	10/16	10/24	10/31	11/6	11/14	11/20	11/28	12/12	2/27
⑤ Individualized goals are set for all students including students with quick understanding									●	●	●	△	△
④ Goal is set for students with some concerns						●		●					
③ Goal is set for the students with difficulties in learning					●		●						
② One goal is set, and teacher follow-ups for students who can't achieve the goal		○	○	●									
① One goal is set for whole class	○												

Note: ○ represents score for baseline phase (6/27/09-9/12/09), ● represents score for scores for intervention phase (10/9/09-11/28/09), and △ represents scores for follow-up phase (12/12/09, 2/27/10)

Table 12. Result of Goal Attainment Scale Objective 2 for Case 3

Objective 2 Teachers provide appropriate learning materials for individual needs

Scales towards Objectives	6/27	7/16	9/12	10/9	10/16	10/24	10/31	11/6	11/14	11/20	11/28	12/12	2/27
⑤ There is a system that all students may use supplemental teaching materials when needed									●	●	●	△	△
④ Student would decide if he/she needs to use supplemental teaching materials						●							
③ Supplemental teaching materials are provided to the students with some concerns when needed							●	●					
② Supplemental teaching materials are provided to the students with difficulty in learning			○		●								
① Use one material for whole class	○	○		●									

Note: ○ represents score for baseline phase 6/27/09-9/12/09), ● represents score for scores for intervention phase (10/9/09-11/28/09), and △ represents scores for follow-up phase (12/12/09, 2/27/10)

Table 13. Result of Academic Achievement Test for Case 3

Areas	Class average		Student K	
	Pre	Post	Pre	Post
Interest and motivation toward mathematics	66.7	62.3	66	41
Mathematical thinking	61.1	68.9	8	43
Processing quantities and figures	89.0	83.3	39	50
Knowledge about quantities and figures	81.7	77.4	28	52
Average score for the last 3 areas	77.3	76.5	25	48

Table 14. Result of Q-U profile for Satisfaction with Classroom Life for Case 3

Groups	National average	Case 3 Class(N=30)		Student I	
		Pre	Post	Pre	Post
"satisfaction of classroom life" group	41%	47%(n=14)	50%(n=15)		
"unaccepted in classroom" group	15%	23%(n=7)	17%(n=5)		
"receiving nociceptive behavior" group	18%	0%(n=0)	10%(n=3)		
"dissatisfaction of classroom life" group	23%	30%(n=9)	23%(n=7)	X	X

Table 15. Result of Q-U profile for Motivation for School Life for Case 3

Items	National average	Case 3 Class average		Student I	
		Pre	Post	Pre	Post
Motivation for Learning	9.8	9.5	9.5	8	10
Atmosphere of Classroom	10.2	10.1	10.0	11	10
Relationship with Friends	9.7	9.9	10.1	7	11

APPENDICES

Appendix A: Checklist for Teaching Practice

Checklist for Teaching Practice		We practice this	evaluation	We need to learn
I Foundation for the Class				
①	Teachers are drawing students' attention			
②	There are rules for students' listening and speaking			
③	There are consideration for students' keeping good posture.			
④	Teachers ask thoughtful questions that students would be interested in.			
⑤	Teachers have ingenuity in writing on blackboard			
⑥	Students feel free to ask questions			
⑦	Teachers provide positive acknowledgement to students.			
II Curriculum				
①	The link of the class/unit and the "big ideas " of the course is clear.			
②	Other curricular area is addressed in the class.			
③	The class/unit relate to outcomes for students outside of school			
III Setting Objectives				
①	There are general standards teachers are addressing in the class/unit.			
②	Teachers set objectives according to the learning needs of diverse students.			
IV Instructional Delivery				
①	Teachers provide instructions in a variety of ways.			
②	There are opportunities for hands-on activities for students.			
③	Teachers provide repeated practice on the key concept/skills.			
④	Teachers teach learning strategies to students who need supports.			
V Materials				
①	Teachers provide worksheets for individual learning-time.			
②	Teachers utilize assistive technology to maximize student performance.			
③	Teachers provide learning materials to understand key concept/skills			
④	Teachers provide appropriate learning materials for individual needs.			
VI Student Participation				
①	Teachers allocate time for students thinking.			
②	Teachers provide problem-solving activities.			
③	Teachers plan peer-teaching or team-activities for all students' engagement			
④	Teacher provide students with choice opportunities.			
VII Staff Roles and Students Support				
①	There are roles and responsibilities of the staff in the classroom.			
②	Teachers provide appropriate level of instructional support to individuals			
VIII Assessment				
①	Teachers assess students learning using multiple methods during class.			
②	Students have a variety of ways to express what they have learned.			
③	Teachers use ongoing assessment data to refine instruction for the next.			
③	Level of attainment is clear for individual students with diverse objectives			

Appendix B: Review Sheet for Your Practice

Please pick 10 items from the list that you are practicing with most attention.

Describe the specific contents of your practice.

Item No. from the list	Specific Contents of Your Practice

Appendix C: Worksheet for Your Objectives

Objectives of Your Choice	Move to make to for your objectives	Step1	Step2	Step3	
	Teacher				
	Consultant				
	T				
	C				
	T				
	C				
	T				
	C				
	T				
	C				

Appendix D: Example of GAS Scale and Record Form

Scales towards Objectives	11/1	11/2	11/5	11/7	11/9	11/12		
⑤ Provide multiple learning materials so that all students understand key concepts								
④ Provide individual materials to support students with special learning needs						●		
③ Provide multiple learning materials for whole class (without checking understanding)				●	●			
② Provide one learning material for whole class	●		●					
<input type="checkbox"/> Provide only verbal instructions		●						
comments								